ACT Government

# ACT BUSHFIRE MANAGEMENT STANDARDS


JUSTICE AND COMMUNITY SAFETY DIRECTORATE
ACT EMERGENCY SERVICES AGENCY

VERSION 1.2 – MARCH 2025

# Acknowledgments

ACT Emergency Services Agency (ACTESA) and the ACT Rural Fire Service would like to express gratitude to the stakeholders involved in delivering the ACT Bushfire Management Standards.

Project Leads

- Gregory Potts AFSM – ACT Rural Fire Service
- Scott Seymour – ACT Emergency Services Agency

NSW Rural Fire Service

- The ACT Emergency Services Agency would like to acknowledge the assistance of NSW Rural Fire Service with providing advice, and content from their publication Planning for Bushfire Protection 2019.

Project Team

- Lynda Scanes – ACT Rural Fire Service
- Ailish Milner – ACT Rural Fire Service
- Chris Condon – ACT Rural Fire Service
- Stuart Laing – ACT Fire & Rescue
- Guy Cassis – ACT Fire & Rescue
- Chris White – ACT Fire & Rescue
- Jeff Dau – ACT Fire & Rescue

Document Formatting and Publishing

- Tashi Loday – ACT Emergency Service Agency

Key Stakeholders

- ACT Fire & Rescue
    - Risk and Planning Section
- Environment Planning and Sustainable Development Directorate
    - Parks and Conservation Service
    - Office of the Conservator of Flora and Fauna
    - Conservation Research and Evaluation
    - Planning and Sustainable Development
- Transport Canberra and City Services
    - Place Management

# Foreword

The ACT Bushfire Management Standards (BMS) have been reviewed under the Strategic Bushfire Management Plan, (SBMP), Version. 4 Action 6.10. The review was an opportunity to update the Standards, which were introduced with SBMP Version 3 in September 2014. The BMS are also developed under Section 77B of the *Emergencies Act 2004.* The BMS is a live document and the most up to date version can be found on the ACT Legislation Register.

The ACT landscape and weather can interact to create extreme bushfire conditions, which may allow bushfires to impact on the urban edge and rural areas of the Territory. Because there are limits on how much the risk presented by these fires can be reduced, the ACT Government commits to the continuous improvement of its bushfire risk management strategies through ongoing research, analysis, and adoption of an adaptive management approach.

Adaptive management is a structured, iterative process of sound decision making which aims to reduce uncertainty over time through monitoring and evaluation. This model is ideally suited to dealing with the impacts of climate change, which holds uncertainty about future conditions to be experienced by fire and emergency services and the community. The principles and application of adaptive management apply to all elements of bushfire management. These include ecological monitoring of the effects of fuel management, how firefighters respond to and manage bushfires, and how well the government and community recover from disaster events.

The ACT Climate Change Strategy to 2025 provides the basis for an integrated, whole-of-government approach to adaptation policies and plans. Planning for climate change is one challenge to which the ACT Government and community need to respond. According to an Australasian Fire and Emergency Services Authorities Council report 9, climate change is expected to produce higher mean and extreme temperatures leading to longer fire seasons and more fuel available to burn. This will provide conditions for greater frequency and higher than average intensity bushfires, especially in south-eastern Australia.

Climate change is complex with much still unknown. Addressing uncertainties in future projections of bushfire risk is the subject of ongoing research in Australia and overseas. The ACT Government needs to plan for plausible climate futures and related bushfire risks. Through its adaptation responses, the ACT continues to improve resilience to climate impacts of the community and built environment.

**Conflict Statement**

When using the BMS, where ACT Government Policies and Procedures are in conflict, consultation between policy and procedure owners must be undertaken to ensure an agreement can be reached and ensure breaches are managed and expectations are set early. ACT Emergency Services Agency will assist with facilitating consultation where the BMS is involved.

**National Construction Code (NCC) 2022 – NOTE**

In May 2023 the National Construction Code was updated from the 2019 to 2022 version. Due to the timing of the publication of the NCC and BMS, there may be slight differences between reference and requirements. Please consult with ACTESA if you identify inconsistencies that may impact your development.

# Content


**SECTION 1. INTRODUCTION ..... 10**

1.1 AIM AND OBJECTIVES ..... 10
1.2 BUSH FIRE PROTECTION PRINCIPLES ..... 11
1.3 LIMITATIONS OF THIS DOCUMENT ..... 11
1.3.1 Fire Danger Index ..... 11
1.3.2 Clarification of Fire Danger Index versus Fire Behaviour Index ..... 11
1.3.3 Fuel loads ..... 11
1.3.4 Existing developments ..... 12
1.3.5 Human behaviour ..... 12
1.3.6 Maintenance ..... 12
1.3.7 Performance-based approach ..... 12
1.4 HOW TO READ THIS DOCUMENT ..... 12
1.4.1 Bush fire protection measures ..... 13
1.4.2 Intent ..... 13
1.4.3 Performance criteria ..... 13
1.4.4 Acceptable solutions ..... 13
1.4.5 Performance-based solutions ..... 13

**SECTION 2. FRAMEWORK ..... 16**

2.1 LEGAL FRAMEWORK ..... 16
2.1.1 Legal Framework ..... 16
2.2 BUSHFIRE PRONE AREA MAPPING ..... 16
2.3 STRATEGIC PLANNING ..... 17
2.4 DEVELOPMENT ASSESSMENT ..... 17
2.4.1 Development requiring ACT Emergency Services Agency (ESA) Approval ..... 17
2.4.2 Development Assessment – Exempt Development ..... 17
2.5 NATIONAL CONSTRUCTION CODE (NCC) AND BUSH FIRE STANDARDS ..... 18
2.6 ACT STRATEGIC BUSHFIRE MANAGEMENT PLAN (SBMP) ..... 18
2.7 EMERGENCY SURVIVAL PLANS ..... 18

**SECTION 3. BUSH FIRE PROTECTION MEASURES ..... 20**

3.1 INTRODUCTION ..... 20
3.1.1 Applying the BPMs in combination ..... 20
3.2 ASSET PROTECTION ZONES (APZ) ..... 21
3.2.1 Staged developments ..... 22
3.2.2 APZs on slopes over 14 degrees ..... 22
3.2.3 APZs on environmentally protected lands ..... 22
3.2.4 Defendable space ..... 22
3.2.5 APZs on adjoining land ..... 23
3.3 BUILDING CONSTRUCTION, SITING AND DESIGN ..... 23
3.4 ACCESS ARRANGEMENTS ..... 23
3.4.1 Perimeter/edge roads ..... 23
3.4.2 Non-perimeter roads ..... 23
3.4.3 Property access roads ..... 24
3.4.4 Fire trails ..... 24
3.5 WATER SUPPLY AND UTILITIES ..... 24
3.6 EMERGENCY MANAGEMENT ARRANGEMENTS ..... 24
3.7 LANDSCAPING ..... 25

**SECTION 4. STRATEGIC PLANNING ..... 27**

4.1 PLANNING PROCESS ..... 27
4.2 THE ACT TERRITORY PLAN ..... 27
4.3 DISTRICT AND ZONE POLICIES ..... 28
4.4 STRATEGIC PRINCIPLES ..... 29
4.5 STRATEGIC PLANNING IN BUSH FIRE PRONE AREAS ..... 30
4.6 APPROVALS ..... 31
4.7 RESIDUAL RISK ..... 31

**SECTION 5. SUBDIVISIONS ..... 33**

5.1 BACKGROUND ..... 33
5.1.1 Existing dwellings ..... 33
5.1.2 Subdivision in grassland hazard areas ..... 33
5.2 SPECIFIC OBJECTIVES ..... 34
5.3 BUSH FIRE PROTECTION MEASURES ..... 34
5.3.1 APZs ..... 34
5.3.2 Access ..... 35
5.3.3 Services – Water, electricity, and gas ..... 37

**SECTION 6. SENSITIVE USE DEVELOPMENTS ..... 41**

6.1 INTRODUCTION ..... 41
6.2 SPECIFIC OBJECTIVES ..... 41
6.3 OBJECTIVES FOR SPECIFIC USES ..... 42
6.3.1 Specific tourism uses ..... 42
6.3.2 Specific residential-based sensitive use development ..... 43
6.4 DEVELOPMENT OF EXISTING SENSITIVE USE DEVELOPMENT FACILITIES ..... 43
6.5 MINOR DEVELOPMENT IN SENSITIVE USE DEVELOPMENT FACILITIES ..... 44
6.6 SENSITIVE USE DEVELOPMENT IN GRASSLAND AREAS ..... 45
6.7 BUSH FIRE PROTECTION MEASURES ..... 45
6.7.1 APZs and building construction ..... 45
6.7.2 Access ..... 47
6.7.3 Services – Water, gas, and electricity ..... 49
6.7.4 Emergency management planning ..... 50

**SECTION 7. RESIDENTIAL INFILL DEVELOPMENT ..... 53**

7.1 INTRODUCTION ..... 53
7.2 HOME-BASED OCCUPATIONS ..... 55
7.2.1 Home-based childcare ..... 55
7.3 SPECIFIC OBJECTIVES ..... 55
7.4 BUSH FIRE PROTECTION MEASURES ..... 55
7.5 FENCES AND GATES ..... 59
7.6 DETERMINATION OF THE BAL ..... 59
7.7 BETTER BUSH FIRE OUTCOMES ..... 59
7.8 GRASSLAND DEEMING PROVISIONS ..... 60

**SECTION 8. OTHER DEVELOPMENT ..... 63**

8.1 INTRODUCTION ..... 63
8.2 OTHER RESIDENTIAL DEVELOPMENT ..... 63
8.2.1 Increased residential densities ..... 63
8.2.2 Multi-storey residential development ..... 64
8.2.3 Historic buildings ..... 66
8.3 OTHER NON-RESIDENTIAL DEVELOPMENT ..... 66
8.3.1 Buildings of Class 5 to 8 under the NCC ..... 66
8.3.2 Class 10 structures ..... 67
8.3.3 Private bush fire shelters ..... 67

8.3.4 Wind, solar farms, and Battery Energy Storage Systems (BESS) ..... 67
8.3.5 Telecommunications towers ..... 68
8.3.6 Outdoor events in bush fire prone areas ..... 69
8.3.7 Hazardous industry ..... 70
8.3.8 Public assembly buildings ..... 70

**APPENDIX 1.** SITE ASSESSMENT METHODOLOGY ..... 72

**A1.1.** APPLICATION ..... 72
**A1.2.** DETERMINE VEGETATION FORMATION ..... 72
A1.2.1. About the classification system ..... 72
**A1.3.** GRASSLAND ASSESSMENT ..... 74
**A1.4.** DETERMINE SLOPE ..... 74
**A1.5.** DETERMINE EFFECTIVE SLOPE ..... 76
**A1.6.** DETERMINE APPROPRIATE FIRE (WEATHER) AREAS ..... 76
**A1.7.** DETERMINE BUSH FIRE ATTACK LEVEL ..... 76
**A1.8.** SHIELDING ..... 77
**A1.9.** EXOTIC VEGETATION ..... 78
**A1.10.** LOW THREAT VEGETATION – EXCLUSIONS ..... 79
**A1.11.** ASSESSING REMNANT BUSHLAND AND NARROW VEGETATION CORRIDORS ..... 80
A1.11.1. Simplified approach ..... 80
A1.11.2. Short fire run 80
**A1.12.** COMPREHENSIVE APZ, BAL AND VEGETATION CLASS TABLES ..... 80

**APPENDIX 2.** SUBMISSION REQUIREMENTS, PERFORMANCE-BASED SOLUTIONS AND BUSH FIRE DESIGN BRIEFS ..... 85

**A2.1.** SUBMISSION REQUIREMENTS FOR A BUSH FIRE ASSESSMENT REPORT ..... 85
A2.1.1. Subdivisions 85
**A2.2.** SUBMISSION REQUIREMENTS FOR RESIDENTIAL INFILL DEVELOPMENT ..... 86
**A2.3.** SUBMISSION REQUIREMENTS AND ASSESSMENT METHODS FOR PERFORMANCE-BASED SOLUTIONS ..... 86
A2.3.1. Assessment methods ..... 87
**A2.4.** BUSH FIRE DESIGN BRIEF (BFDB) ..... 87
**A2.5.** BUSH FIRE MANAGEMENT PLAN ..... 87
**A2.6.** QUALIFIED CONSULTANTS ..... 88
**A2.7.** PRE-DA ADVICE ..... 88

**APPENDIX 3.** ACCESS ..... 90

**A3.1.** VERTICAL CLEARANCE ..... 90
**A3.2.** VEHICLE TURNING REQUIREMENTS ..... 90
**A3.3.** VEHICLE TURNING HEAD REQUIREMENTS ..... 92
**A3.4.** PASSING BAYS ..... 93
**A3.5.** PARKING ..... 93
**A3.6.** KERB DIMENSIONS ..... 94
**A3.7.** SERVICES ..... 94
**A3.8.** LOCAL AREA TRAFFIC MANAGEMENT (LATM) ..... 94
**A3.9.** ROAD TYPES ..... 94
A3.9.1. Perimeter Roads ..... 94
A3.9.2. Non-perimeter Roads ..... 94
A3.9.3. Property access ..... 95
A3.9.4. Standards – fire trails ..... 96
**A3.10.** ROAD SIGN STANDARDS ..... 97
**A3.11.** AERIAL ACCESS ..... 97
A3.11.1. Aerial access classification ..... 97
A3.11.2. Aerial access construction and maintenance ..... 98

**APPENDIX 4.** ASSET PROTECTION ZONE REQUIREMENTS ..... 100

**A4.1.** ASSET PROTECTION ZONES ..... 100
A4.1.1. Inner Asset Protection Zones (IAPZs) ..... 100

**APPENDIX 5.** FUEL MANAGEMENT STANDARDS ..... 103

**A5.1.** EXPLANATORY NOTES – FUEL MANAGEMENT STANDARDS ..... 105
A5.1.1. Overall fuel hazard ..... 105
A5.1.2. Grassland curing ..... 105
A5.1.3. Grassland fuel hazard ..... 105
A5.1.4. Grass Curing 106
A5.1.5. Grass Height 108
A5.1.6. Grass Cover 108

ABBREVIATIONS, DEFINITIONS AND REFERENCES ..... 110

ABBREVIATIONS ..... 110
DEFINITIONS ..... 112
REFERENCES ..... 116

# List of Tables

Table 1. Bush Fire Strategic Study ..... 30
Table 2. Equivalent values for FFDI and GFDI ..... 34
Table 3. Performance criteria and acceptable solutions for APZs for residential subdivisions. ..... 35
Table 4. Performance criteria and acceptable solutions for access for residential subdivisions. ..... 35
Table 5. Performance criteria and acceptable solutions for water, electricity, and gas services for subdivisions. ..... 38
Table 6. Water supply requirements for non-reticulated developments or where reticulated water supply cannot be guaranteed. ..... 39
Table 7. Performance criteria and acceptable solutions for APZs and construction for Sensitive use development. ..... 45
Table 8. Performance criteria and acceptable solutions for access for Sensitive use development. ..... 47
Table 9. Performance criteria and acceptable solutions for water, electricity, and gas services for Sensitive use development. ..... 49
Table 10. Performance criteria and acceptable solutions for emergency management plans for Sensitive use development. 51
Table 11 Asset Interface Classification matrix ..... 53
Table 12 Widths for Inner and Outer Asset Protection Zones (APZs) ..... 54
Table 13 Width for Inner APZs (with no Outer APZ) ..... 54
Table 14 Performance criteria and acceptable solutions for residential and rural residential infill development. ..... 56
Table 15 Grassland Deeming Provisions ..... 61
Table 16 Issues and considerations specific to multi-storey residential development. ..... 65
Table 17 Radiant heat flux exposure and appropriate Bush Fire Attack Level (BAL). ..... 77
Table 18 Exotic vegetation conversions ..... 79
Table 19 Minimum distances for APZs – Sensitive use development (<10kW/m2, 1200K) ..... 82
Table 20 Minimum distances for APZs – residential development, FFDI 100 areas (<29kW/m2, 1090K) ..... 82
Table 21 Determination of BAL, FFDI 100 – residential developments ..... 83
Table 22 Minimum curve radius for turning vehicles. ..... 90
Table 23 Fire trail access standards ..... 96
Table 24 Nominal requirements for passing and dead-end fire trails ..... 97
Table 25 Helipad standards ..... 98
Table 26 Fuel management standards – Asset Protection Zones ..... 103
Table 27 Fuel management standards – Strategic Firefighting Advantage Zones (SFAZs) ..... 104
Table 28 Fuel management standards – other zones ..... 104
Table 29 Grassland Fuel Hazard scores ..... 106
Table 30 Grass curing – key attributes ..... 107

# List of Figures

Figure 1. Step-by-step guide on how to use BMS ..... 14
Figure 2. BPMs in combination ..... 20
Figure 3. ACT Strategic Planning Framework for Bushfire ..... 27
Figure 4. Territory planning framework ..... 28
Figure 5. Description of vegetation formations. ..... 73
Figure 6. Determine slope ..... 75
Figure 7. Effective slope. ..... 76
Figure 8. Radiant heat impact and shielding. ..... 78
Figure 9. Plan view of radiant heat impact and shielding. ..... 78
Figure 10. Vertical clearance ..... 90
Figure 11. Swept path width for turning vehicles. ..... 91
Figure 12. Roundabout swept path. ..... 91
Figure 13. Multipoint turning options. ..... 92
Figure 14. Passing bays can provide advantages when designed correctly. Poor design can and does severely impede access. ..... 93
Figure 15. Hydrants and parking bays. ..... 93
Figure 16. Carriageway kerb clearance dimensions. ..... 94
Figure 17. Perimeter road widths. ..... 94
Figure 18. Non-perimeter road widths. ..... 95
Figure 19. Property access roads are to be a minimum of 4m wide. ..... 95
Figure 20. Grass height ..... 108
Figure 21. Grass cover ..... 108

# SECTION 1. INTRODUCTION

The ACT Bushfire Management Standards (BMS) provide development standards for designing and building on bush fire prone land in the ACT. (Sections 1-8)

The BMS also provides detailed fuel management, roads, and access standards for Land Management coordinated by various Government organisations and private land managers. (Appendix 3 and 5). These standards have been prepared under the ACT Strategic Bushfire Management Plan, and detail the measurable outcomes required for better bushfire outcomes. These support the Fire Services, land managers, developers as well as the general community in achieving effective results in reducing bushfire risk.

The BMS have been developed utilising previous ACT standards and combining them with elements of the more contemporary NSW Planning for Bush Fire Protection (PBP) document. BMS provides standards and guidance for:

- strategic land use planning to ensure that new development is not exposed to high bush fire risk.
- approving new residential and subdivision allotments
- sensitive use development taking account of occupant vulnerability.
- bush fire protection measures (BPMs) for new buildings; and
- upgrading and maintaining existing development.
- Fuel Management for existing Asset Protection Zones, Strategic Firefighting Advantage Zones. Landscape, Aboriginal, and Agricultural Fire Management Zones.
- Informs access trails and helicopter landing pad standards.

BMS is applicable to all development located on bush fire prone area (BPA) in the ACT as mapped by the ACT Emergency Services Agency (ESA). All development includes subdivisions, residential and commercial development, regardless of whether it is publicly or privately owned or managed. The general principles underlying this document are that:

- a suite of BPMs is required to reduce the impact of a bush fire.
- protection measures are governed by the degree of threat posed to a development and the vulnerability of occupants.
- minimising the interface of a development to the hazard reduces the bush fire risk to the development; and
- good practice in planning, building and management reduces the risk to developments and their occupants and increases their resilience.

## 1.1 AIM AND OBJECTIVES

All development in BPA must satisfy the aim and objectives of the ACT BMS.

The aim of BMS is to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment.

The objectives are to:

- afford buildings and their occupants protection from exposure to a bush fire.
- provide for a defendable space to be located around buildings and infrastructure, including road reserves.
- provide appropriate separation between a hazard and buildings which, in combination with other measures, reduce the likelihood of fire spread to buildings.
- ensure that appropriate operational access and egress for emergency service personnel and occupants is available.

- inform access standards to areas of the ACT including track and trail, helipads in remote areas.
- provide for ongoing management and maintenance of BPMs; and
- ensure that utility services are adequate to meet the needs of firefighters.

## 1.2 BUSH FIRE PROTECTION PRINCIPLES

Bush fire protection can be achieved through a combination of strategies which are based on the following principles:

- control the types of development permissible in bush fire prone areas.
- minimise the impact of radiant heat and direct flame contact by separating development from bush fire hazards.
- minimise the vulnerability of buildings to ignition and fire spread from flames, radiation, and embers.
- enable appropriate access and egress for the community and firefighters.
- provide adequate water supplies for bush fire suppression operations on the urban interface.
- focus on property preparedness, including emergency planning and property maintenance requirements; and
- facilitate the establishment and maintenance of Asset Protection Zones (APZs), fire trails, access for firefighting and on-site equipment for fire suppression.

## 1.3 LIMITATIONS OF THIS DOCUMENT

Due to a range of limitations, the measures contained in this document do not guarantee that loss of life, injury and/or property damage will not occur during a bush fire event. Limitations of this document include, but are not limited to uncertainties in the following areas:

- Fire Danger Index
- fuel loads
- existing developments
- human behaviour; and
- property and Asset Protection Zone maintenance.

### 1.3.1 Fire Danger Index

It is possible that days of higher Fire Danger Index (FDI) may be experienced than the FDI levels used in this document. This could result in fire situations where conditions challenge the survivability of buildings and their occupants.

### 1.3.2 Clarification of Fire Danger Index versus Fire Behaviour Index

On the 1st of September 2022, the Australian Fire Danger Rating System (AFDRS) was improved and simplified. The changes made largely relate to public information regarding fire danger risk. FDI is now referred to as the Fire Behaviour Index (FBI). FDI or FFDI however, remains appropriate to this document for technical reasons and is still referenced.

### 1.3.3 Fuel loads

BMS has adopted a system of assessing fuel accumulation rates based on vegetation formations and time since last fire (Forestry Commission of NSW, 1991). This has also been supported by published literature on fuel loads (i.e., Good, 1994, Watson, 2005, Cheney and Sullivan, 1997). In some instances, fuel loads in an area may be higher than those used in this document. This can influence bush fire behaviour and the potential impact on property.

### 1.3.4 Existing developments

Existing developments may have limited or no BPMs incorporated into the design of the building. This presents major challenges for the design of alterations and additions to existing buildings.

### 1.3.5 Human behaviour

A person's behaviour in times of bush fire may be unpredictable. A person may have good intentions to stay and defend their property from bush fire but may change their mind once they experience the stress and anxiety associated with the heat, noise, flames, and embers. Even where a development can comply with BMS, unpredictable human behaviour can be a limiting factor and may result in injury, death, or loss of property.

All occupants in a bush fire prone area are encouraged to prepare an Emergency Survival Plan, available to download at ACT ESA website | ACT Emergency Services Agency.

### 1.3.6 Maintenance

An unprepared property is not only a risk to the building owner/occupant but may also present an increased danger to neighbouring buildings and firefighters. Even buildings which are built to comply with BMS are placed at risk through poor maintenance.

Post bush fire research recorded by the New South Wales Rural Fire Service (NSW RFS) indicates that proper maintenance of dwellings and their curtilage significantly improves the survivability of structures.

Advice regarding the maintenance and protection of existing buildings can be found on the ESA website at https://esa.act.gov.au/.

### 1.3.7 Performance-based approach

Applications for development on BPA must include a bush fire assessment report. This report must demonstrate that the proposal satisfies the requirements of BMS. All applications must meet the Aim and Objectives of BMS.

BMS uses a performance-based approach and identifies objectives and detailed performance criteria to satisfy desired outcomes and meet the Aims and Objectives. Any performance-based approach must demonstrate that bush fire protection is afforded to a proposed development commensurate with the assessed level of bush fire risk and the characteristics of the occupants. This can be achieved by either applying the identified acceptable solutions, or by preparing a performance-based solution.

A performance-based solution must be designed to achieve the appropriate level of protection by tailoring a package of measures which meet the intent and performance criteria relevant to the proposed development.

BPMs are set out in Section 3. Performance criteria and acceptable solutions are shown for each specified development type in Sections 5-8.

## 1.4 HOW TO READ THIS DOCUMENT

**Section 1 Introduction** – Introduction and overview of bushfire protection measures, bushfire management standards and performance-based approach. Details the two different applications of the document, being provision of development standards for designing and building on bush fire prone land in the ACT. (Sections 1-8), and Public Land Management standards for application by ACT Government (Appendix 3 and 5).

**Section 2 Framework** – The basis and triggers for the activation of these technical standards.

**Section 3 Bushfire Protection Measures** – Overview and explanation of the bushfire protection measures necessary for life safety and compliance purposes.

**Section 4 Strategic Planning** – Process as defined by Environment, Planning and Sustainable Development Directorate (EPSDD)

**Section 5 Residential Subdivisions** – Bushfire management standards for residential subdivisions.

**Section 6 Sensitive Use Development** – Bushfire management standards for sensitive use development.

**Section 7 Residential infill development** – Bushfire management standards for residential infill development (see definitions).

**Section 8 All Other Development** – Bushfire management standards for all other types of development.

**Appendices** – Technical information supporting bushfire management standards including land management requirements.

### 1.4.1 Bush fire protection measures

BPMs are the relevant specifications and requirements that need to be satisfied to improve life safety, property protection and community resilience to bush fire attack.

They include:

- APZs
- Access
- Construction, siting, and design
- Landscaping
- Services; and
- Emergency and evacuation planning.

### 1.4.2 Intent

For each BPM, a broad intent is outlined. The ensuing performance criteria and acceptable solutions are designed to ensure that the general intent for each BPM is met.

### 1.4.3 Performance criteria

Performance criteria are the outcomes that need to be achieved to satisfy the intent. The performance criteria can be satisfied in one of the following ways:

- acceptable solutions; or
- performance-based solution; or
- the combination of the above.

### 1.4.4 Acceptable solutions

Sections 5-8 identify acceptable solutions which are considered by the ACT ESA as meeting the performance criteria.

### 1.4.5 Performance-based solutions

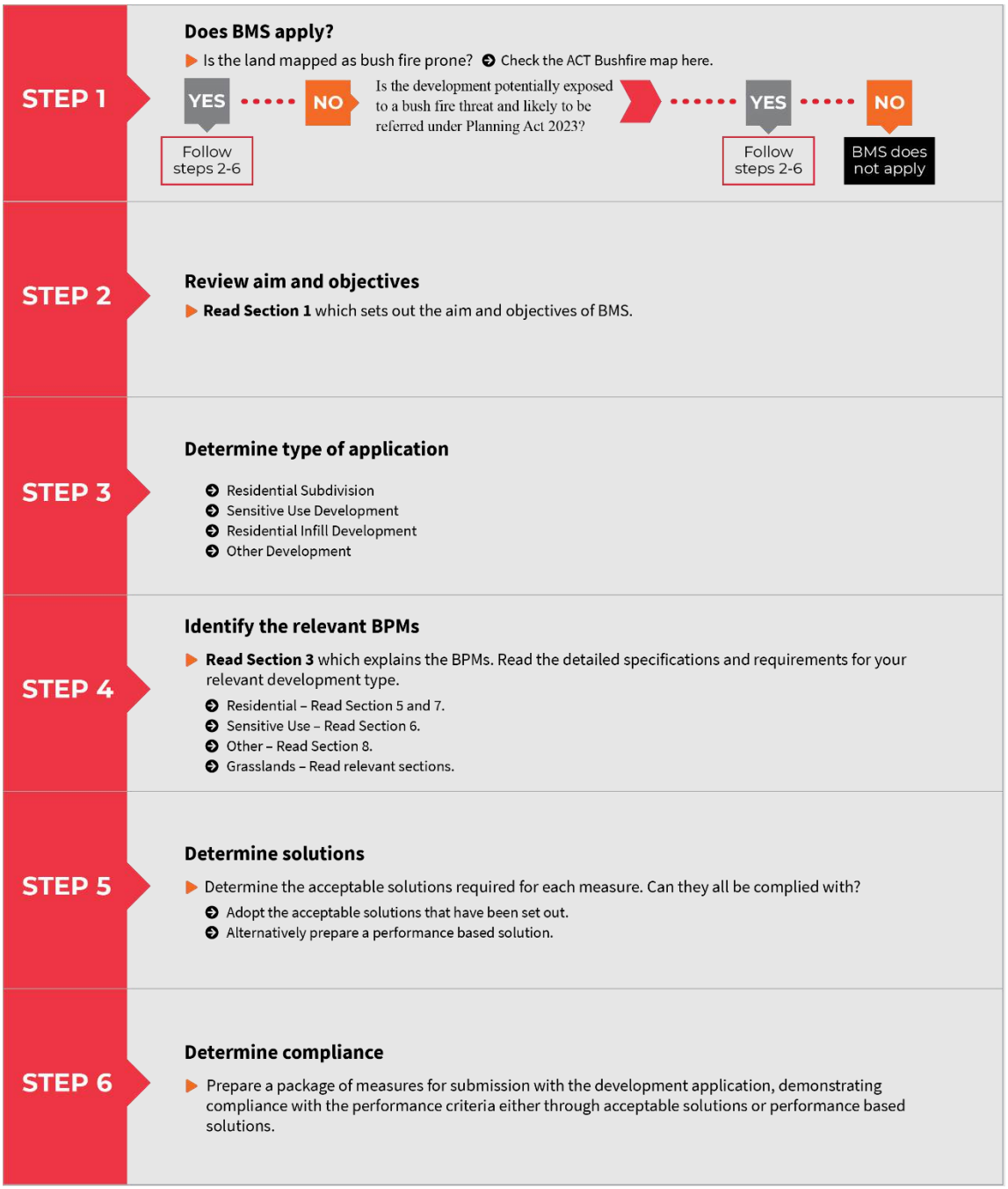
Performance-based solutions allow flexibility and innovation in responding to site-specific opportunities and constraints while still meeting the identified performance criteria. They also allow the consideration of a broad range of issues and information, including bush fire risk, community expectations, environmental protection and the application of new science, processes, and technologies.

Performance-based solutions must provide substantiated evidence and clearly demonstrate how the specific objectives and performance criteria are to be satisfied.

When performance-based solutions are proposed, they will be assessed on their merits and individual circumstances. In these circumstances, a Bush Fire Design Brief (BFDB) process can be undertaken which would involve early agreement on the key elements and acceptance criteria from all stakeholders including the ACT ESA.

Performance-based solutions may be undertaken for any of the BPMs detailed in Section 3 and supported in accordance with the submission requirements in Appendix 2.

**Figure 1. Step-by-step guide on how to use BMS**



RFS4

# SECTION 2. FRAMEWORK

BMS is intended to enhance community resilience to bush fires. Bush fire should be considered in every phase of planning and development process, from District Strategies, land-use (re)zoning, subdivisions to individual development applications.

Comprehensive consideration of bush fire in the planning system requires a sound understanding of the hazards and risks, as well as consideration of strategic planning and development controls that will adequately mitigate these identified risks, as outlined in the National Disaster Resilience Strategy, (COAG 2011).

## 2.1 LEGAL FRAMEWORK

### 2.1.1 Legal Framework

In the ACT, a dual planning regime, has been established with the Australian Government and ACT Government sharing statutory and strategic planning responsibility. The ACT Government is responsible for most of the day-to-day planning matters including the assessment and determination of development applications and is based on a Track system such as Code, Merit or Impact Track depending on the type and significance of the development. In this regard, the *Planning Act 2023* and the Territory Plan set out the legal framework for the type of development permitted or prohibited within various land use zones as depicted in the Territory Plan. Note this applies to Territory Land whereas the Commonwealth has control of 'Designated Land' and National Land. The various areas can be found on the Authority's website known as ACTmapi.

Some development, where certain criteria is met under the *Planning (Exempt Development) Regulation 2023* and *Planning (General) Regulation 2023* (Planning Regulations), can be undertaken as exempt development. In certain circumstances major developments may be required to undergo pre-Development Application Community Consultation and may involve a proponent to address any bushfire management matters that are relevant to their proposals.

Development on land that is identified as being within a bushfire prone area and subject to relevant suburb Precinct Code bushfire provisions under the Territory Plan is to comply with the Planning for Bushfire Risk Mitigation General Code which is also contained within the Territory Plan. Bushfire prone areas are identified on the ACT Government's ACTMAPI web site and development proposal proponents are encouraged to familiarise themselves with relevant bushfire requirements at the early planning stages for their respective development proposals and any requirements that may apply under the National Construction Code.

## 2.2 BUSHFIRE PRONE AREA MAPPING

The ACT BPA Maps provide the trigger for development assessment under the *Planning Act 2023*. The ACT BPA map is not intended as a detailed measure of risk. You can determine whether a site is mapped as being bush fire prone by referring to the BPA Map found on the ACTmapi website here.

The National Construction Code (NCC) defines BPA as land which has been designated under a power of legislation as being subject, or likely to be subject, to bushfires. Under the Strategic Bushfire Management Plan (SBMP), the Commissioner of the ACT ESA designates what constitutes BPA and how it is to be mapped. This map is reviewed and updated annually.

The ACT BPA map does not form part of the site assessment process, which must be carried out in accordance with Appendix 1.

## 2.3 STRATEGIC PLANNING

Strategic planning is the preparation of planning instruments and policies and includes the identification of subdivision of new greenfield areas, housing strategies and other planning instruments that identify proposed uses and land zonings changes. This also includes any associated strategic proposals and studies.

The strategic planning phase of development is particularly important in contributing to the creation of safer and sustainable communities (COAG 2011). It is an effective way of achieving bush fire protection objectives in new developments.

Strategic bush fire planning and studies are needed to avoid high risk areas, ensure that zoning is appropriate to allow for adequate emergency access, egress, and water supplies, and to ensure that future compliance with this document is achievable. Strategic Bushfire planning will also ensure that areas adjacent to new developments are able to be managed effectively for risk mitigation and that infrastructure (fire trails, fire stations and land management depots) that may be required is considered early in planning processes.

The most important objective for strategic planning is to identify whether new development is appropriate subject to the identified bush fire risk on a landscape scale. An assessment of proposed land uses and potential for development to impact on existing infrastructure is also a key element of the strategic planning process in bush fire prone areas. Land use planning policies can be introduced to limit the number of people exposed to unacceptable risk through the type of development that may be permitted in a specific area e.g., low density residential compared to high density residential.

Planning instruments and policies can ensure bush fire management principles are given appropriate consideration at all stages of the planning and development process.

Once development has been assessed as being appropriate in its bush fire prone context, it will need to be capable of complying with BMS. The ability of proposed land uses and associated future developments to comply with BMS will be assessed further through the strategic planning stages. The expectation will be that the development will be able to comply with BMS at the subsequent DA stage.

## 2.4 DEVELOPMENT ASSESSMENT

The provisions of this document apply to relevant development on land, which is located within a bushfire prone area, and may include in certain instances development proposals that only involve a variation to a block's Crown Lease, for example to add non-agricultural uses to a Rural block Crown Lease purpose clause. For further information please contact the Environment, Planning and Sustainable Development DA Gateway Team on 02 6207 1923. The Gateway Team is the first point of contact for all enquiries relating to ACT planning matters and obtaining information about the Development Application process.

### 2.4.1 Development requiring ACT Emergency Services Agency (ESA) Approval

Certain Development Applications, including development proposals on an infill or greenfield site (such as an Estate Development Plan) that have been lodged with the independent planning and land authority for assessment and determination will be formally referred to the ESA for advice and comments. Where relevant, ESA conditions may be imposed on a development application approval and are required to be met prior to any approved plans being released or any works commencing on site.

### 2.4.2 Development Assessment – Exempt Development

In certain circumstances, such as the demolition of a single dwelling, an application seeking development approval will not be required if it meets the relevant requirements of the Planning Regulation and is dependent on the type of project being proposed. These exemptions can be accessed in the *Planning (Exempt Development) Regulation 2023.*

A private building certifier or works assessor may be able to grant an exemption from requiring development approval. If a development is exempt from requiring development approval, it may still need building approval or

other approvals including, for example, the Emergency Services Commissioner's approval for an exempt development on an existing school site located in a bushfire prone area (refer to s1.99AA - Additional exemption criterion—bushfire prone areas) of the Regulation.

In relation to exempt development, and before issuing a building approval, a building certifier must be satisfied that:

> building work that does not have a development approval meets the relevant development exemption criteria and does not require a development application; and

> related sitework, such as tree protection and tree removal and excavation required for the building work shown in a building approval application is either:

- exempt from requiring development approval, if the exemption requirements for the building work also require the sitework to be exempt, or
- the relevant building work is in accordance with a development approval.

## 2.5 NATIONAL CONSTRUCTION CODE (NCC) AND BUSH FIRE STANDARDS

The NCC is a performance-based code which comprises the Building Code of Australia (BCA) as Volumes 1 and 2 and the Plumbing Code of Australia as Volume 3.

The NCC contains Performance Requirements and Deemed-to-Satisfy provisions relating to the construction of buildings in bush fire prone areas. These provisions apply to Class 1, 2 and 3 buildings, Class 4 parts of a building, Class 9 buildings, and associated class 10a buildings and decks.

## 2.6 ACT STRATEGIC BUSHFIRE MANAGEMENT PLAN (SBMP)

The SBMP is the overarching document that directs all forms of bushfire mitigation planning in the ACT. The purpose of the SBMP is to provide a broad strategic framework to protect the ACT community from bushfires and reduce resulting harm to the physical, social, cultural, and economic environment of the Territory. A link to the SBMP can be found on the ESA website.

## 2.7 EMERGENCY SURVIVAL PLANS

People living in a Bush Fire Prone Area should prepare an Emergency Survival Plan which is revised annually prior to the bush fire season which can be found at https://esa.act.gov.au/be-emergency-ready/resources-plans/survival-plan.

The Emergency Survival Plan has been developed by the ACT ESA to assist residents. On days of catastrophic fire weather, the ACT ESA recommends leaving early as the only safe option.

# SECTION 3. BUSH FIRE PROTECTION MEASURES

BPMs can mitigate the impact of bush fire attack on people and assets.

The types of protection measures include APZs, access, landscaping, water supply, building design and construction and emergency management arrangements. These measures assist building survival during a bush fire. They also contribute to the safety of firefighters and members of the community occupying buildings during the passage of a bush fire front.

Design and location of emergency services facilities within the community, is considered to provide the quickest and best response to any incident.

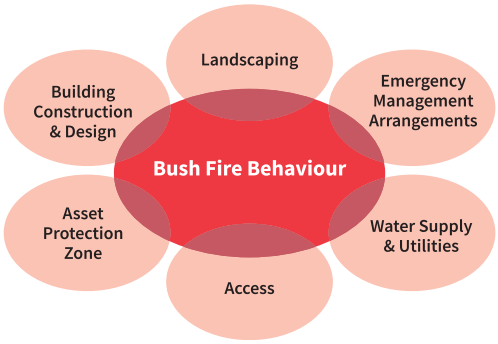
There are a range of different BPMs which should be applied in combination based upon the development type and the level of bush fire risk.

All requirements for BPMs that relate to the development must be provided, as required by this document.

## 3.1 INTRODUCTION

A significant part of the ACT is classified as BPA and local circumstances vary widely as do potential land uses. BMS recognises this and promotes detailed site analysis and the application of a combination of BPMs to achieve an acceptable outcome.

**Figure 2. BPMs in combination**




### 3.1.1 Applying the BPMs in combination

The design of BPMs should be incorporated at the earliest stages of development. Acceptable bush fire protection proposals will involve a combination of different BPMs depending on their suitability and importance to the development and different levels of potential bush fire attack.

Appropriate combinations of BPMs not only depend on geographic location and site circumstances but also on the nature of the proposed use, distinguishing between the following development types:

- subdivision of land for residential, industrial, and other uses.
- sensitive use development.
- residential infill development; and
- other types of developments (i.e., commercial community and other uses which are not classified as residential or sensitive use development).

These development types are required to achieve specific objectives which relate to circumstances. The acceptable solutions and performance criteria in this document acknowledge that the measures work in combination to improve the capacity for bush fire protection.

Research on bush fire behaviour under a range of location, weather, vegetation, and slope conditions has demonstrated the significance of reduced fuel loads and separation distance in limiting the bush fire threat from ember attack through to direct flame contact.

## 3.2 ASSET PROTECTION ZONES (APZ)

An APZ is a buffer zone between a bush fire hazard, buildings and other assets. The APZ is managed to minimise fuel loads and reduce potential radiant heat levels, flame, localised smoke, and ember attack. The appropriate APZ distance is based on vegetation type, slope, and the nature of the development. Any significant assets, such as, playgrounds, BBQ's, recreation equipment, utility infrastructure and traffic management devices, should be managed to minimise the impact of fire. Any assets that contribute to fire spread or radiant heat increase may not be appropriate to place in an APZ and consultation with ESA may be required.

The APZ can include roads or properties managed to be consistent with APZ standards set out in Appendix 4. A fuel-reduced, physical separation between buildings, and other assets, and bush fire hazards is a key element in the suite of bush fire measures and has a major influence on the type of construction necessary to mitigate bush fire attack.

Appendix 1 provides the required methodology for determining the APZ based on vegetation type, slope and FFDI.

For new residential subdivision, APZ requirements are based on radiant heat level exposure to buildings not exceeding 29kW/m² (calculated on a flame temperature of 1090 Kelvin). This is in line with SBMP's approach to new greenfield estates.

For many sensitive use developments, larger APZs are required because of the characteristics of occupants. This means a lower radiant heat threshold is required to allow for evacuation of occupants and emergency services to operate in support of the most at-risk members of the community.

For most sensitive use development, 10kW/m² (calculated on a flame temperature of 1200 Kelvin) is the maximum exposure at any point of the building wall or façade and where emergency services may be supporting or evacuating occupants from the building.

This is to ensure there is an area for firefighters to defend the property and allow access to and from the building. Section 6 identifies the performance criteria and acceptable solutions for APZs for sensitive use development.

Information relating to the creation and management of APZs is detailed in Appendix 4 of this document.

A fundamental premise for APZs in new developments built after 2022, is that they are provided within the development footprint, ensuring they are cost effective to manage, and that the owner or land manager will be able to maintain the area in perpetuity. The APZ should be able to be managed in a manner which is considerate of the environmental values present at the site.

APZs in existing residential zones established prior to 2022 can utilise Inner Asset Protection zones (IAPZ) as mapped and determined by the ESA. These can be found on the ACTmapi website (www.actmapi.act.gov.au). This is to ensure that development such as knock-down/rebuild and renovations greater than 51% of original structure may not be subject to new conditions not imposed at time of construction. Any land use or zoning changes to original development may increase the risk to occupants and/or structures. Consultation with ESA is required for determination in these areas.

Please note – all other fire management zones other than the IAPZ cannot be used for APZ purposes.

Where possible, buildings should be sited to reduce exposure to bush fire attack and provide suitable defendable space around a building.

### 3.2.1 Staged developments

Often an indefinite time lag can occur between one or more stages of development which can result in persons and property being unprotected in the event of a bush fire. This is particularly the case for greenfield subdivision. A development site that is vegetated but is to be developed and sold in stages will require the creation of temporary APZs that need to be maintained sequentially until the final phase of development is completed to afford each stage of the development the appropriate level of bush fire protection.

Therefore, in staged developments, temporary APZs need to be provided during all stages, and provisions included that ensure ongoing maintenance is undertaken until such time as land is developed.

### 3.2.2 APZs on slopes over 14 degrees

APZs on slopes greater than 14 degrees present ongoing maintenance difficulties and may have reduced effectiveness. Challenges in these circumstances may include the following:

- management practices may be difficult.
- the environmental consequences of ground clearing (destabilisation of the slope resulting in landslip, slump, erosion, or landslide) may not be acceptable; and
- vegetation is more readily available to a fire, significantly reducing the advantage of having an APZ.

Where it can be demonstrated that these issues can be effectively managed, APZs on steeper slopes may be considered. Where there are effective slopes more than 14 degrees, it must be demonstrated that management can occur. A management plan must be submitted with the DA to provide details on how the APZ will be implemented and maintained. The management plan should include, but not be limited to:

- The mechanical means necessary to complete the management required.
- Any built elements to enable management of slopes should be designed to allow for access by intervening spaces by suitable equipment i.e., spaces between two retaining walls must be wide enough to accommodate a slasher and have an entry wide enough for the machine to access.
- A schedule for maintenance to occur to ensure the APZ is regularly managed; and
- The relevant body responsible for maintaining the APZ.

### 3.2.3 APZs on environmentally protected lands

Where environmentally sensitive vegetation such as endangered ecological communities are to be cleared for the purposes of an APZ, the proposals will need to be carefully considered. Such a situation may also require separate Commonwealth and ACT statutory environmental approvals.

Any environmental constraints caused by the implementation of an APZ should be assessed by the appropriate authority. In the ACT, the Conservator for Flora and Fauna can impose conditions relating to environmentally sensitive issues within APZ's. These considerations must consider cost effective management of APZ's if they contain environmentally sensitive vegetation.

### 3.2.4 Defendable space

Defendable space is an area within the Inner Asset Protection Zone (IAPZ) of an APZ adjoining a building and may include a road reserve.

This space provides a safe working environment in which efforts can be undertaken to defend the structure, before and after the passage of a bush fire.

The physical size of the development will determine whether the defendable space is provided as pedestrian access or will require sufficient space for vehicular movements. Vegetation within the defendable space should be kept to an absolute minimum and the area should be free from combustible items and obstructions.

### 3.2.5 APZs on adjoining land

An APZ imposed by a development consent condition must be maintained for the lifetime of the development, unless modified by a subsequent consent. To guarantee that an APZ can be managed in perpetuity, IAPZs should be contained within the overall development site and not on adjoining lands. Any APZ on adjoining lands cannot be used without consultation and approval from the ESA and relevant land manager.

## 3.3 BUILDING CONSTRUCTION, SITING AND DESIGN

The appropriate design and construction of buildings enhance their survivability from bush fires. Construction measures should not be applied as a stand-alone mitigation solution but should form part of a suite of BPMs. This should also include APZs, appropriate access, water supply and landscaping.

Building design needs to ensure adequate protection of vulnerable building elements. Construction standards are outlined in AS 3959 and the NASH Standard to provide various levels of protection for different building elements.

The level of building construction standard required is based on the FFDI, type of vegetation, the effective slope, and the size of APZ. Appendix 1 provides the required methodology for assessing the building construction standards referred to in AS 3959 and the NASH Standard as BALs.

## 3.4 ACCESS ARRANGEMENTS

Design of access roads shall enable safe access and egress for residents attempting to leave the area while emergency service personnel are arriving to undertake firefighting operations.

Sections 5-8 detail performance criteria and acceptable solutions for access arrangements, relevant to the development type. Specific access design principles are included in Appendix 3.

In a bush fire prone area, the purpose of the road system is to:

- provide firefighters with access to structures, allowing more efficient use of firefighting resources.
- provide evacuation routes for firefighters and the community; and
- provide access to areas of bush fire hazard for firefighting and hazard mitigation purposes.

Roads shall provide sufficient width and other dimensions to ensure safe unobstructed access and allow firefighting crews to operate equipment around the vehicle. Road width is defined as the trafficable width from kerb to kerb or the inside edge of the table drain.

Dead-end roads should be avoided. However, where they are present, they must incorporate a sufficient turn-around area to minimise the need for vehicles to make multipoint turns.

### 3.4.1 Perimeter/edge roads

A perimeter or edge road must be provided to separate bush and grass land from urban areas, allowing more efficient use of firefighting resources. A perimeter road is located on the outer extremity of a local area or subdivision and usually runs parallel to the bush and grass land interface. Dimensions and conditions should be consistent with the ACT Estate Development Code.

The perimeter road provides space to conduct active firefighting operations and hazard reduction activities. In developments where no perimeter road exists, property defence in a bush fire event may be more difficult.

### 3.4.2 Non-perimeter roads

Non-perimeter roads are the interconnecting roads between the perimeter roads and the existing and/ or broader road network. These roads form a link for firefighting operations by providing access for emergency vehicles, a safe space for conducting property protection, and a suitable road network for egress of residents.

### 3.4.3 Property access roads

Property access is any access from private land onto the public road system. In rural areas, operational difficulties can be experienced in accessing buildings. Examples include water crossings and roads which may be cut off by fire or other hazardous conditions. As a result, the location and standards of property access roads should be carefully considered.

### 3.4.4 Fire trails

Fire trails are used as access for firefighters in operational situations, as fire containment lines and for APZ maintenance. Fire trails are also used for recreational and land management purposes.

Fire trails are not required for compliance with BMS. A fire trail is not a substitute for a road, nor is it considered an appropriate trade-off for the provision of perimeter, non-perimeter, or property road access requirements.

Fire trail requirements are detailed in A3.9.4 Standards – fire trails.

## 3.5 WATER SUPPLY AND UTILITIES

An adequate supply of water is essential for firefighting purposes. In addition, gas and electricity should be located so as not to contribute to the risk of fire or impede the firefighting effort.

Suitable water supply arrangements shall be provided for firefighting that meet the ESA requirements. It is essential to ensure that any water sources are maintained at the appropriate capacity (see Tables 5, 9 and 14).

Where a non-reticulated water supply is provided or the reticulated water supply is deemed inadequate, an additional on-site stored supply of water for firefighting will be required. Non-reticulated water is a supply that is not piped by Icon Water and includes rainwater, ground water or surface water.

From a firefighting point of view, any source of available water may be used during a bush fire event and tanks are not always the most practical option. Considering the above, and the increasing demand for sustainable and efficient use of our water resources, the ESA prefers that water is solely dedicated for firefighting purposes. As such, water holding structures such as tanks, swimming pools and dams can be considered if they are accessible, reliable, and adequate. Nevertheless, where a water supply is provided it must be available for the lifetime of the development.

Water capacities, access for firefighters (tanker or pedestrian) and the provision of appropriate connections must also be considered when determining if a proposed water source is suitable.

Where a Static Water Supply (SWS) is provided, a SWS sign should be installed in a visible location on the street front. Regular testing of firefighting equipment should also occur to ensure that it is maintained in working order.

## 3.6 EMERGENCY MANAGEMENT ARRANGEMENTS

Sensitive use development is identified as being more vulnerable to the effects of bush fire. This is because the occupants may have a mental or physical impairment, may experience language difficulties, may be unaware of their surroundings or the bush fire risk and may be unable to self-evacuate.

Due to their vulnerability, a higher degree of planning and emphasis on emergency management is required for all sensitive use development. It is imperative that emergency management arrangements are identified at the development planning phase for these developments. An indication of proposed emergency management arrangements should be provided with the DA. A Bush Fire Emergency Evacuation and Management Plan must be prepared for any sensitive use development.

Emergency planning arrangements are not required for residential developments. However, anyone living in a bush fire prone area should prepare an Emergency Survival Plan which is available on the ACT ESA website here.

## 3.7 LANDSCAPING

You can use landscaping to increase the chances of you and your home surviving a bushfire. This can be done by planning, designing, planting, and managing the area around your house. Design and plant selection can help reduce the effects of direct flame contact and radiant heat on a building. A helpful resource to assist with landscaping for bushfire can be found on the CSIRO website here https://research.csiro.au/bushfire/landscaping/.

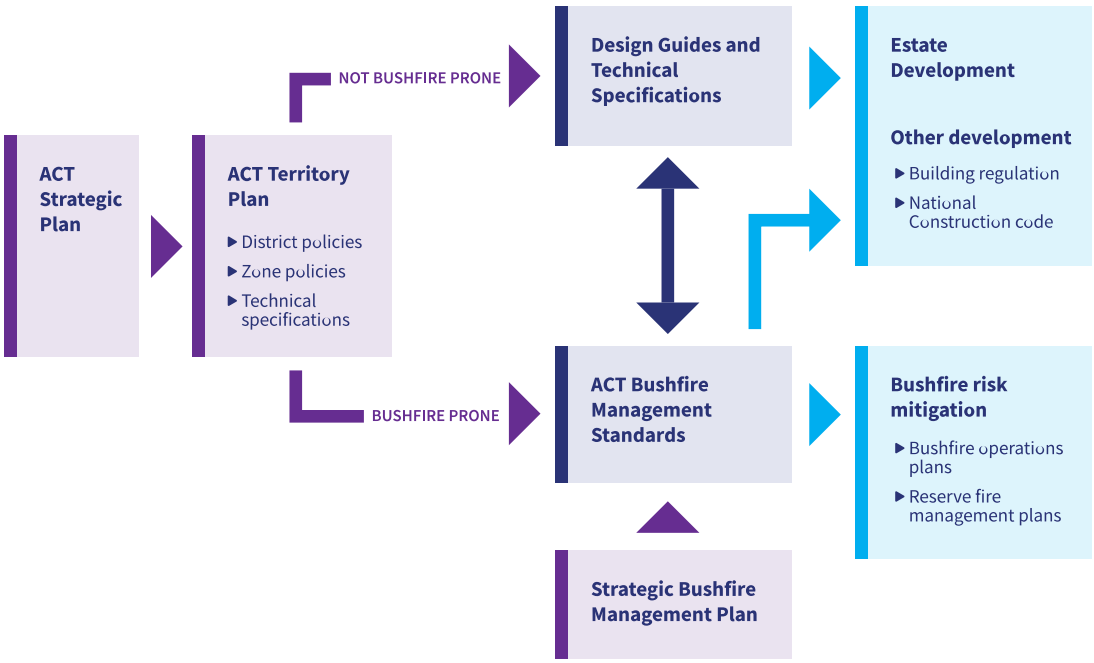
# SECTION 4. STRATEGIC PLANNING

Strategic planning is the first stage in the planning process. It is needed to ensure that businesses and future development are not exposed to an unacceptable risk of bush fire. Unacceptable risk is a situation where bushfire protection measures have not been considered or addressed in accordance with AS3959 Construction of buildings in bushfire prone areas, NCC, and the BMS, where development occurs within the bushfire prone area.

## 4.1 PLANNING PROCESS

Strategic planning in the ACT is a clearly structured process. The planning framework for managing bushfire risk for development is guided by the ACT Planning Strategy, the District Strategies, and the Territory Plan. The Territory Plan contains District Policies and Zone Policies and is supported by design guides and technical specifications. The Territory Plan and associated documents contain the planning provisions that apply to development in the ACT, including new subdivisions.

**Figure 3. ACT Strategic Planning Framework for Bushfire**

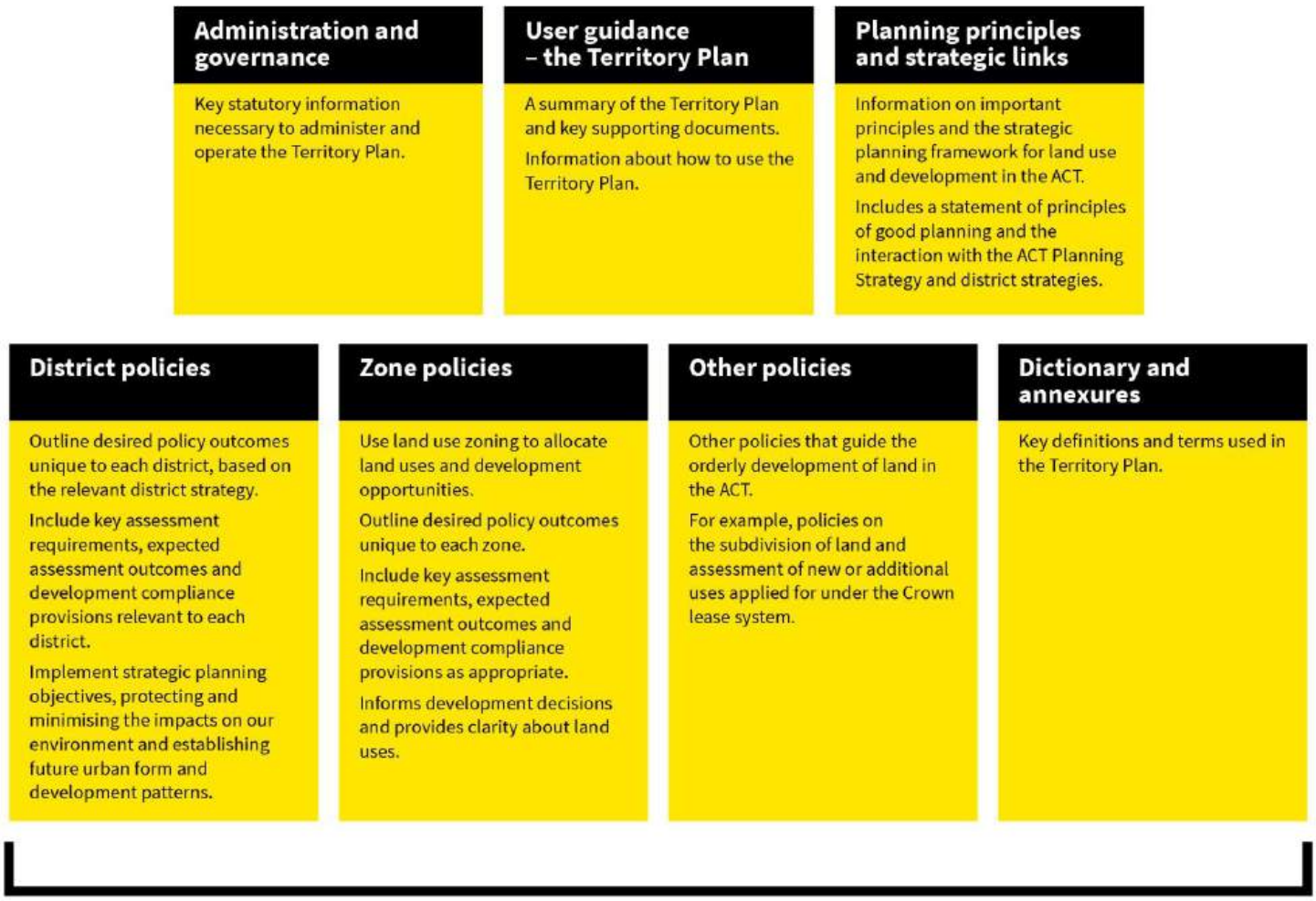



The ACT Strategic Bushfire Management Plan complements the territory plan in coordinating bushfire risk mitigation across government, providing direction for land managers and planners.

## 4.2 THE ACT TERRITORY PLAN

By providing the planning requirements applicable to development, the Territory Plan is an effective tool in minimising or avoiding the impact of natural hazards such as bush fire. From a risk management perspective, the safest approach is always to avoid high risk areas. District and zone policies, as well as the Subdivision Policy, consider the impacts of natural hazards and how they can be minimised through the location and design of developments.

**Figure 4. Territory planning framework**




## 4.3 DISTRICT AND ZONE POLICIES

District and zone policies are for various areas across the ACT. District policies contain the requirements that apply to specific districts or areas within a district, for example to Inner South as a whole, to Kingston as a suburb or specific blocks within that suburb. Zone policies contain the requirements that apply to a specific zones or

group of zones, for example to the RZ1 Suburban Zone or all residential zones. The requirements help to define the characteristics of development in a zone, such as uses permitted and building height.

District and zone policies set a clear direction for future development in a district or zone. As with area specific policies, the requirements in a district policy take precedence over any relevant requirements in a zone policy.

The ACT ESA is a key stakeholder and is consulted in the development of district and zone policies to ensure that appropriate strategies are developed, and future conflicts do not occur.

## 4.4 STRATEGIC PRINCIPLES

Strategic planning in the ACT is underpinned by the ACT Wellbeing Framework. The ACT Wellbeing Framework comprises twelve domains of wellbeing, reflecting key factors that impact on the quality of life of Canberrans.

Strategic planning for bushfire risk mitigation has the focus of maintaining and improving the quality of life for ACT Residents and neighbours.

One of the principles of the ACT Planning Strategy is to reduce vulnerability to natural hazard events and adapt to climate change. The strategy recognises the importance of integration of emergency management considerations with strategic land use planning.

The ACT Government's policy on bushfire risk reduction is one of shared responsibility between the Government and the community. That is, the responsibility for risk mitigation does not belong to the Government or private landowners alone. This means that from the broad scale of our nature reserves and open spaces, down to the smaller scale of our home and workplace, we all share the responsibility to design, make and manage a safe living and working environment. Together the community and the Government are responsible for actions to reduce bushfire risks to property, assets, and personal safety on their own land. Land surrounding the urban area is managed for one or more core functions - production (agriculture/forestry), recreation and/or nature conservation. It is also recognised that there are human values such as landscape beauty ascribed to this land and that land management regimes are also to take account of these values. The principle of shared responsibility for reducing bushfire risk affects all developments and adjoining lands.

In a bush fire context, strategic planning will ensure that future land uses are in appropriate locations to minimise the risk to life and property from bushfire attack.

The area in the ACT that has been assessed as bushfire prone is identified by the ACT ESA on ACTmapi.

In the Bushfire Prone Area, detailed analysis is required to support development. The broad principles which apply to this analysis are:

- ensuring land is suitable for development in the context of bush fire risk.
- ensuring new development on bushfire prone land will comply with the Strategic Bushfire Management Standards.
- minimising reliance on performance-based solutions.
- providing adequate infrastructure associated with emergency evacuation and firefighting operations; and
- facilitating appropriate ongoing land management practices.

Strategic planning should provide for the exclusion of inappropriate development in bush fire prone areas as follows:

- the development area is exposed to a high bush fire risk and should be avoided.
- the development is likely to be difficult to evacuate during a bush fire due to its siting in the landscape, access limitations, fire history and/or size and scale.

- the development will adversely affect other bush fire protection strategies or place existing development at increased risk.
- the development is within an area of high bush fire risk where density of existing development may cause evacuation issues for both existing and new occupants; and
- the development has environmental constraints to the area which cannot be overcome.

The relevant BPMs in Chapters 5-8 of this document are to be considered at the strategic planning stage to ensure that future development can comply with the BMS.

Development proposals in bush fire prone areas require the preparation of a Bush Fire Assessment Report (see Appendix 2).

## 4.5 STRATEGIC PLANNING IN BUSH FIRE PRONE AREAS

A further Bushfire Risk Assessment (Strategic Bush Fire Study) may also be required at the subdivision design application (detail subdivision) stage to further refine and confirm any site-specific requirements identified in the relevant district policy or district specification to be imposed on development.

The Bushfire Risk Assessment will specifically consider the following matters set out in Table 1.

**Table 1. Bush Fire Strategic Study**

| ISSUE | DETAIL | ASSESSMENT CONSIDERATIONS |
|---|---|---|
| **Bush fire landscape assessment** | A bush fire landscape assessment considers the likelihood of a bush fire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape. | > The bush fire hazard in the surrounding area, including:<br>• Vegetation<br>• Topography<br>• Weather<br>> The potential fire behaviour that might be generated based on the above.<br>> Any history of bush fire in the area.<br>> Potential fire runs into the site and the intensity of such fire runs; and<br>> The difficulty in accessing and suppressing a fire, the continuity of bush fire hazards or the fragmentation of landscape fuels and the complexity of the associated terrain. |
| | | > |
| **Land use assessment** | The land use assessment will identify the most appropriate locations within the masterplan area or site layout for the proposed land uses. | > The risk profile of different areas of the development layout based on the above landscape study.<br>> The proposed land use zones and permitted uses.<br>> The most appropriate siting of different land uses based on risk profiles within the site (i.e., not locating development on ridge tops, sensitive-use development to be in lower risk areas of the site); and<br>> The impact of the siting of these uses on APZ provision. |
| **Access and egress** | A study of the existing and proposed road networks both within and external to the masterplan area or site layout. | > The capacity for the proposed road network to deal with evacuating residents and responding emergency services, based on the existing and proposed community profile.<br>> The location of key access routes and direction of travel; and |

| | | |
|---|---|---|
| | | > The potential for development to be isolated in the event of a bush fire. |
| **Emergency services** | An assessment of the future impact of new development on emergency services. | > Consideration of the increase in demand for emergency services responding to a bush fire emergency including the need for new stations/ brigades; and<br>> Impact on the ability of emergency services to carry out fire suppression in a bush fire emergency. |
| **Infrastructure** | An assessment of the issues associated with infrastructure and utilities. | > The ability of the reticulated water system to deal with a major bush fire event in terms of pressures, flows, and spacing of hydrants; and<br>> Life safety issues associated with fire and proximity to high voltage power lines, natural gas supply lines etc. |
| **Adjoining land** | The impact of new development on adjoining landowners and their ability to undertake bush fire management. | > Consideration of the implications of a change in land use on adjoining land including increased pressure on BPMs through the implementation of Bush Fire Management Plans. |

## 4.6 APPROVALS

Where the Bushfire Risk Assessment, or report, is part of a district policy or district specification, the assessment and its recommendations are required to be endorsed by the EPSDD, the Emergency Services Agency (ESA) and any other relevant Government Agency.

## 4.7 RESIDUAL RISK

Regardless of bushfire protection and fuel mitigation measures put in place, there will always be an element of risk. Identifying the residual risk is critical for assessing the development, as we recognise that it is not possible to eliminate all risk.

# SECTION 5. SUBDIVISIONS

For the purposes of this document, subdivision of land is the creation of lots for residential or other purposes such as new industrial areas.

Where a new subdivision is created, it is important to ensure that appropriate BPMs are provided within the new development. This allows for protection measures to be fully incorporated at the design stage of development.

## 5.1 BACKGROUND

New subdivisions may pose significant challenges from a planning and/or bush fire risk perspective and may require additional considerations.

The subdivision stage of land development provides an opportunity for early consideration of siting and access and for the incorporation of the appropriate combination of BPMs.

Estate Development Plans (EDPs) set out the proposed subdivision pattern and infrastructure works for a new estate. EDPs must be submitted as development applications for approval by EPSDD. Development approval of the EDP is required before design acceptance can be obtained from TCCS, works can commence, and leases issued for the subdivided blocks. The EDP is assessed against the relevant parts of the Estate Development Code and any applicable structure plan or precinct code. An EDP that relates to a future urban area must comply with section 94 of the *Planning Act 2023*. For land that is not future urban area, or subject to a precinct code, an EDP will be assessed primarily against this code.

### 5.1.1 Existing dwellings

While all new dwellings within a subdivision must comply with BMS, there may be existing dwellings located on the land that would benefit from BPMs.

Conditions may therefore be applied to the subdivision consent requiring the existing structure to be upgraded to provide ember protection and water supplies for firefighting.

Advice regarding the maintenance, upgrading and protection of existing buildings can be found on the ACTESA website www.esa.gov.au.

### 5.1.2 Subdivision in grassland hazard areas

The risk posed by grass fires is different to that of fires in other vegetation types. Grass fires spread more rapidly with a shorter residence time. Embers produced by grass fires are smaller and fewer in number than those produced from forest fires.

At residential subdivision stage, an assessment must be carried out to determine whether an APZ can be provided around the proposed development to avoid flame contact. Subdivision will not be supported where the development would be BAL-40 or BAL-FZ. The APZ distances identified in Tables 19 and 20 provide the acceptable solutions for meeting this threshold.

All the other performance criteria and acceptable solutions within Tables 2 to 5 apply to residential and rural residential proposals in grassland hazard areas. Table 2 provides the relevant FFDI to utilise for grassland hazard areas.

**Table 2. Equivalent values for FFDI and GFDI**

| FOREST FIRE DANGER INDEX (FFDI) | GRASSLAND FIRE DANGER INDEX (GFDI) |
|---|---|
| **50** | 70 |
| **80** | 110 |
| **100** | 130 |

## 5.2 SPECIFIC OBJECTIVES

The specific objectives for subdivisions are as follows:

- minimise perimeters of the subdivision exposed to the bush fire hazard (hourglass shapes, which maximise perimeters and create bottlenecks should be avoided).
- minimise vegetated corridors that permit the passage of bush fire towards buildings.
- provide for the siting of future dwellings away from ridge-tops and steep slopes, within saddles and narrow ridge crests.
- ensure that APZs between a bush fire hazard and future dwellings are effectively designed to address the relevant bush fire attack mechanisms.
- ensure the ongoing cost-effective maintenance of APZs.
- provide adequate access from all properties to the wider road network for residents and emergency services.
- provide access to hazard vegetation to facilitate bush fire mitigation works and fire suppression; and
- ensure the provision of an adequate supply of water and other services to facilitate effective firefighting.

## 5.3 BUSH FIRE PROTECTION MEASURES

The BPMs for residential subdivisions include measures relating to APZs, access to structures and water supply, fire trail access, and provision of water. Electricity and gas services should be provided so that they don't add to the bush fire risk to buildings.

All requirements for BPMs that relate to the development must be provided, unless where specific circumstances apply to render a BPM irrelevant (i.e., no landscaping required).

### 5.3.1 APZs

**Intent of measures:** to provide sufficient space and maintain reduced fuel loads to ensure radiant heat levels at the buildings are below critical limits and prevent direct flame contact.

**Table 3. Performance criteria and acceptable solutions for APZs for residential subdivisions.**

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| **The intent may be achieved where:** | |
| **ASSET PROTECTION ZONES** | |
| > **potential building footprints must not be exposed to radiant heat levels exceeding 29 kW/m² on each proposed lot.** | APZs are provided in accordance with Table 20 |
| > **APZs are managed and maintained to prevent the spread of a fire towards the building.** | APZs are managed in accordance with the requirements of Appendix 4. |
| > **the APZs is provided in perpetuity.** | APZs are wholly within the boundaries of the development site |
| > **APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.** | APZs are located on lands with a slope less than 14 degrees. |
| **LANDSCAPING** | |
| > **landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.** | landscaping is in accordance with Appendix 4 |

### 5.3.2 Access

**Intent of measures:** to provide safe operational access to structures and water supply for emergency services, while residents are seeking to evacuate from an area.

**Table 4. Performance criteria and acceptable solutions for access for residential subdivisions.**

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| **ACCESS (GENERAL REQUIREMENTS)** | |
| > **firefighting vehicles are provided with safe, all-weather access to structures.** | > property access roads are two-wheel drive, all-weather roads.<br>> perimeter roads are provided for residential subdivisions.<br>> subdivisions have more than one access in and out of the development.<br>> traffic management devices are constructed to not prohibit access by emergency services vehicles. |

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| | > 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.<br>> all roads are through roads.<br>> dead end roads are not recommended, but if unavoidable, incorporate a minimum 12 metres outer radius turning circle.<br>> where kerb and guttering are provided on perimeter roads, roll top kerbing should be used to the hazard side of the road.<br>> one way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression. |
| > **the capacity of access roads is adequate for firefighting vehicles.** | > the capacity of perimeter and non-perimeter road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles |
| > **there is appropriate access to water supply.** | > hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression.<br>> hydrants are provided in accordance with the relevant clauses of AS 2419.1 (as referenced) - *Fire hydrant installations System design, installation, and commissioning*; and<br>> there is suitable access for a Heavy Tanker fire appliance to within 4m of the static water supply where no reticulated supply is available. |
| **PERIMETER ROADS** | |
| > **access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.** | > are two-way sealed roads.<br>> minimum 7.5m carriageway width kerb to kerb.<br>> parking is provided outside of the carriageway width; hydrants are located clear of parking areas.<br>> are through roads, and these are linked to the internal road system at an interval of no greater than 500m.<br>> curves of roads have a minimum inner radius of 6m.<br>> the maximum grade road is 15 degrees and average grade of not more than 10 degrees.<br>> the road crossfall does not exceed 3 degrees; and<br>> a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided. |
| **NON-PERIMETER ROADS** | |
| > **access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating.** | > minimum 5.5m carriageway width kerb to kerb.<br>> parking is provided outside of the carriageway width; hydrants are located clear of parking areas.<br>> roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m. |

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| | > curves of roads have a minimum inner radius of 6m; the road crossfall does not exceed 3 degrees; and<br>> a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided. |
| **PROPERTY ACCESS** | |
| > **firefighting vehicles can access the dwelling and exit the property safely.** | > There are no specific access requirements in an urban area where an unobstructed path (no greater than 70m) is provided between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles.<br>In circumstances where this cannot occur, the following requirements apply:<br>> minimum 4m carriageway width.<br>> a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.<br>> provide a suitable turning area in accordance with Appendix 3.<br>> curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress.<br>> the minimum distance between inner and outer curves is 6m.<br>> the crossfall is not more than 10 degrees.<br>> maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads; and<br>> a development comprising more than three dwellings has access by dedication of a road and not by right of way.<br>Note: Some short constrictions in the access may be accepted where they are not less than 3.5m wide, extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above. |

### 5.3.3 Services – Water, electricity, and gas

**Intent of measures:** to provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building.

**Table 5. Performance criteria and acceptable solutions for water, electricity, and gas services for subdivisions.**

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| **WATER SUPPLIES** | |
| > **adequate water supplies are provided for firefighting purposes.** | > reticulated water is to be provided to the development where available.<br>> a static water and hydrant supply is provided for non-reticulated developments or where reticulated water supply cannot be guaranteed; and<br>> static water supplies shall comply with Table 6. |
| > **water supplies are located at regular intervals; and**<br>> **the water supply is accessible and reliable for firefighting operations.** | > fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard AS 2419.1 (as referenced) and ESA requirements.<br>> hydrants are not located within any road carriageway; and<br>> reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads. |
| > **flows and pressure are appropriate.** | > fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1 (as referenced) and ESA requirements |
| > **the integrity of the water supply is maintained.** | > all above-ground water service pipes are metal, including and up to any taps; and<br>> above-ground water storage tanks shall be of concrete or metal. |
| **ELECTRICITY SERVICES** | |
| > **location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.** | > where practicable, electrical transmission lines are underground.<br>> where overhead, electrical transmission lines are proposed as follows:<br>• lines are installed with short pole spacing of 30m, unless crossing gullies, gorges, or riparian areas; and<br>• no part of a tree is closer to a power line than the distance set out in https://www.evoenergy.com.au/residents/trees-and-powerlines |
| **GAS SERVICES** | |
| > **location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.** | > reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 - The storage and handling of LP Gas, the requirements of relevant authorities, and metal piping is used.<br>> all fixed gas cylinders are kept clear of all flammable materials to 10m and shielded on the hazard side.<br>> connections to and from gas cylinders are metal; polymer-sheathed flexible gas supply lines are not used; and<br>> above-ground gas service pipes are metal, including and up to any outlets. |

**Table 6. Water supply requirements for non-reticulated developments or where reticulated water supply cannot be guaranteed.**

| DEVELOPMENT TYPE | WATER REQUIREMENTS |
|---|---|
| Residential lots (<1,000m2) | 5,000L/lot |
| Rural-residential lots (1,000-10,000m2) | 10,000L/lot |
| Large rural/lifestyle lots (>10,000m2) | 20,000L/lot |
| Multi-dwelling housing (including dual occupancies) | 5,000L/dwelling |


CAMPBELL HIGH SCHOOL
Years 7 to 10
Authorised school parking only

# SECTION 6. SENSITIVE USE DEVELOPMENTS

A sensitive use development is one which is occupied by people who are at-risk members of the community and located within the Bushfire Prone Area (BPA) as defined by the ACT Emergency Services Agency (ESA). In a bush fire event, these occupants may be more susceptible to the impacts of bush fire.

Evacuating at-risk members of the community is more challenging because they may be physically or psychologically less able to relocate themselves or are unfamiliar with their surroundings.

Examples of sensitive use development are schools, childcare centres, hospitals, nursing homes and tourist accommodation.

It is important to identify necessary requirements under the National Construction Code (NCC), for sensitive use developments. NCC requirements may significantly increase the cost of construction within the BPA for sensitive use development and may need to be met to obtain approval from the ESA Commissioner.

## 6.1 INTRODUCTION

The ESA Commissioner must approve any blocks or development within the Bushfire Prone Area on which sensitive and vulnerable uses are proposed to be located. These include, but are not limited to, schools, hospitals, nursing homes, supportive housing, aged care facilities, retirement villages, childcare centres, and tourist accommodation.

The nature of sensitive use development means that occupants may be more vulnerable to bush fire attack for one or more of the following reasons:

- they may be less aware in relation to bush fire impacts.
- they may have reduced capacity to evaluate risk and respond adequately to the bush fire threat.
- they may present operational difficulties for evacuation and or management.
- they may be more vulnerable to stress and anxiety arising from bush fire threat and smoke.
- there may be significant communication barriers.
- supervision during a bush fire may be difficult; and
- they may be unfamiliar with the area.

The specific objectives, performance criteria and acceptable solutions for Sensitive use development are given in sections 6.2 to 6.7 of this document.

Different vulnerability characteristics have been identified for certain developments which are classified as sensitive use development. Varied performance criteria and acceptable solutions are identified for these uses in Section 6.3. These Sensitive use developments may not be provided for in Table 19 and will need to be assessed on a performance basis on their own merits.

## 6.2 SPECIFIC OBJECTIVES

Due to the vulnerable nature of the occupants of Sensitive use development, there is more reliance on the provision of an APZ and emergency management.

The specific objectives for sensitive use development are to:

- minimise levels of radiant heat, localised smoke, and ember attack through increased APZ, building design and siting.
- provide an appropriate operational environment for emergency service personnel during firefighting and emergency management.

- ensure the capacity of existing infrastructure (such as roads and utilities) can accommodate the increase in demand during emergencies because of the development; and
- ensure emergency evacuation procedures and management which provides for the special characteristics and needs of occupants.

The intent and performance criteria within the tables in Section 6.7 must be satisfied for sensitive use development.

## 6.3 OBJECTIVES FOR SPECIFIC USES

Sensitive use developments demonstrate different characteristics and may require different levels of protection. As such, tailored objectives are specified for these development types.

Typically, reasons for setting tailored objectives include, but are not limited to:

- lower occupancy levels.
- the presence of a resident/manager on site, thereby improving the potential for informed emergency evacuation decisions; and
- construction under AS 3959 or NASH Standard may be impractical (i.e., tents and caravans).

Varied performance criteria and acceptable solutions are given for specific types of sensitive use development in Tables 7 to 10.

Although construction levels or APZ requirements differ, it is imperative that water provision, emergency management and access provisions are provided commensurate with occupancy levels, assessed level of risk and characteristics of occupants.

The following commentary outlines matters for consideration for specific types of lower risk Sensitive use development.

### 6.3.1 Specific tourism uses

Some Sensitive use development is occupied on a short- term basis by people who are unaware of their surroundings and the appropriate procedure to follow in the event of a bush fire. Short-term accommodation (six weeks or less) must meet the varied performance criteria in Tables 7 to 10.

The ACT ESA defines long-term accommodation as exceeding six weeks in duration and considers that long-term occupants will be familiar with their surrounds, safe refuge areas and evacuation routes. As such, long-term accommodation may be treated as standard residential development and therefore needs to meet a radiant heat threshold of 29kW/m$^2$.

- Caravan parks – Standard type caravans and motor homes used for short-term tourist accommodation generally cannot achieve any level of construction under AS 3959 or NASH Standard. The emphasis is therefore placed on APZs and emergency management, with consideration given to leaving early and non-operation on days of elevated bush fire danger.
- Camping – No construction requirements for tents are provided in AS 3959 or NASH Standard. Camping is permissible within the APZ of a caravan or tourist park, provided the other relevant BPMs (e.g., emergency management arrangements) are in place. Careful consideration should be given to the suitability of camping in bush fire prone areas on days of elevated bush fire danger.
- Primitive camping – Primitive camping is generally more remote from urban areas and is defined as having only a limited range of facilities. The ACT ESA discourages the use of primitive campgrounds in high risk and isolated bush fire prone areas during periods of elevated bush fire danger.
- Bed and breakfast and farm stay accommodation – It is assumed that there is a manager on site who is aware of the bush fire risk and appropriate emergency response procedures and due to the low occupancy rates, the resources and time required for emergency evacuation are reduced. The potential for informed

emergency evacuation decisions is therefore improved. As such, the setback and construction requirements of BAL-29 can be applied.

- Short Term Rental Accommodation (STRA) – Where a building is proposed to be used as STRA in an area with reticulated water, it does not back onto public reserves, and the setback and construction requirements of BAL-29 can be applied, they should be treated as a residential infill arrangement. Alternatively, a performance-based solution will be required demonstrating adequate levels of bush fire safety before such a proposal can be supported by the ACT ESA.
- Ecotourism – Due to its focus on the natural environment and creating minimal impact, the principles of ecotourism and the establishment of APZs for bush fire mitigation are often in conflict. All relevant parties must accept that there is an increase for the potential for loss of structures due to the competing objectives to reduce the environmental footprints of these types of developments. The emphasis is therefore placed on emergency management, leaving early and non-operation on days of extreme or catastrophic fire weather.

At least one building must be provided on site that can be used as a refuge for the maximum number of occupants on site. The building must have a minimum 10kW/m² APZ, be constructed to BAL-12.5 and have vehicular access. Cabins must be within a 100m walking distance of the refuge building.

### 6.3.2 Specific residential-based sensitive use development

- Manufactured home estates – Manufactured housing can be built to achieve all levels of construction required under the NCC.

  Due to the nature of manufactured home estates, there is no mechanism within the development consent process to ensure that the dwellings will be constructed to the standards applied within AS 3959 or NASH Standard. Therefore, the acceptable solution for manufactured housing is the provision of an APZ which achieves 10kW/ m² commensurate with Sensitive use development in line with Table 19.

  Where evidence can be provided which confirms that dwellings within the manufactured home estate will be constructed to the appropriate construction standards under AS 3959 or NASH Standard, an APZ can be provided which meets 29kW/m² in line with Table 20.

- Home based childcare - Due to their residential setting and lower occupant numbers, this use is not considered to be a sensitive use development. The specific standards for home-based childcare can be found in Section 7. It should be noted that there are other forms of childcare which are Sensitive use development, including centre-based childcare and school-based childcare.
- Tertiary institutions - Tertiary institutions such as universities and TAFEs may accommodate large numbers of people with various physical capabilities.

  Where the university or TAFE includes accommodation, the residential component is sensitive use development.

  Other uses in tertiary institutions may not be defined as sensitive use development. This may include assembly occupancies (see Section 8).

## 6.4 DEVELOPMENT OF EXISTING SENSITIVE USE DEVELOPMENT FACILITIES

In circumstances where new building projects within existing Sensitive use development are proposed, an appropriate combination of BPMs are required.

This will involve the Bush Fire Design Brief (BFDB) process where relevant stakeholders agree on the basis for any assessment and measures that will result in a better bush fire outcome for the proposal. The ACT ESA should be consulted early in the design stage. Refer to Appendix 2 for more detailed information on the BFDB process.

The intention for any building work occurring within an existing Sensitive use development is to achieve a better bush fire outcome than if the development did not proceed. Achieving this may require a combination of

measures including improved construction standards, APZs and evacuation management. This may result in a level of retrofitting of existing buildings and managing other portions of the site (i.e., APZs) to ensure an improved level of bush fire protection.

Intensification of the use or increase in occupancy must consider the risk to occupants and firefighters. Where practically achievable, full compliance should be provided before variations to the required BPMs are considered. Proposals that involve internal alterations only, are not subject to any specific requirements unless the proposal results in a change of use, re-purpose and/or involves an increase in occupants.

Existing sensitive use development facilities constructed without the benefit of current bush fire requirements need to consider providing a designated safe refuge building to accommodate all occupants. The safe refuge shall provide a radiant heat threshold of no greater than 10kW/m² and a minimum BAL-12.5 construction.

Existing services such as water supplies, and access may also require upgrading.

Existing structures located within an APZ may be problematic for a new building due to the potential risk of building-to-building fire spread. Where this occurs, a performance-based solution will be required to provide a safer outcome.

A Bush Fire Emergency Management Plan that is consistent with the NSW RFS publication: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan, and the Australian Standard AS 3745 Planning for emergencies in facilities will be required to be prepared for the existing facility.

The objectives that apply to existing sensitive use development are as follows:

- provide an appropriate defendable space.
- site the building in a location which ensures appropriate separation from the hazard to minimise potential for material ignition.
- provide a better bush fire protection outcome for existing buildings.
- new buildings should be located as far from the hazard as possible and should not be extended towards or situated closer to the hazard than the existing buildings (unless they can comply with Table 7 to 10).
- ensure there is no increase in bush fire management and maintenance responsibility on adjoining landowners without their written consent.
- ensure building design and construction enhances the chances of occupant and building survival; and
- provide for safe emergency evacuation procedures including capacity of existing infrastructure (such as roads).

## 6.5 MINOR DEVELOPMENT IN SENSITIVE USE DEVELOPMENT FACILITIES

Minor development includes the following:

- Internal works.
- Flag poles.
- Aerials and antennas.
- Satellite dishes.
- Paved areas.
- Earth works and draining.
- Class 10a structures located further than 6m from a habitable building; and
- Minor non-structural building alterations (external) such as the following:
    - painting, plastering, cement rendering, cladding, attaching fittings or decorative work.

- the replacement of an external window, glazing areas or a door (however, the opening and/or external glazed area of the window or door must not be increased in size).
- the repair to or replacement of a non-structural wall or roof cladding.
- the installation of a security screen or grill to a door or window or a security door.
- the repair to or replacement of a balustrade; and
- re-stumping or repairing structure foundations without increasing the height of the structure.

The development types listed above do not have any influence on potential bush fire impacts and the bush fire protection of the building. For this reason, the ACT ESA does not consider that a Bush Fire Assessment Report is necessary for the development types listed above. Wherever applicable, the building elements concerned will need to comply with the requirements of AS 3959 or NASH Standard under the NCC.

## 6.6 SENSITIVE USE DEVELOPMENT IN GRASSLAND AREAS

A Grassland Fire Danger Index (GFDI) is one of the factors used to calculate APZ distances for Sensitive use development in grassland hazard areas. The APZ values for Sensitive use development in grassland hazard areas are shown in Table 19 in Appendix 1.

## 6.7 BUSH FIRE PROTECTION MEASURES

The BPMs for Sensitive use development should be provided to minimise the risk of fire spread to buildings and consider the increased vulnerability of the occupants.

### 6.7.1 APZs and building construction

**Intent of measures:** to provide suitable building design, construction, and sufficient space to ensure that radiant heat levels do not exceed critical limits for firefighters and other emergency services personnel undertaking operations, including supporting or evacuating occupants.

**Table 7. Performance criteria and acceptable solutions for APZs and construction for Sensitive use development.**

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| **ASSET PROTECTION ZONES** | |
| > **radiant heat levels of greater than 10kW/ m² (calculated at 1200K) will not be experienced on any part of the building.** | > the building is provided with an APZ in accordance with Table 19 in Appendix 1. |
| > **APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.** | > APZs are located on lands with a slope less than 14 degrees. |
| > **APZs are managed and maintained to prevent the spread of fire to the building.**<br>> **the APZ is provided in perpetuity.** | > the APZ is managed in accordance with the requirements of Appendix 4 of this document and is wholly within the boundaries of the development site.<br>> APZ are wholly within the boundaries of the development site; and |

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| | > other structures located within the APZ need to be located further than 6m from the refuge building. |
| **VARIATIONS** | |
| **Camping and primitive camping: no performance criteria applicable.** | > N/A. |
| **Bed and breakfast and farm stay: the building will not be exposed to radiant heat levels exceeding 29kW/m² (1090K).** | > an APZ is provided in accordance with Table 20 in Appendix 1 of this document around the entire building or structure. |
| **Ecotourism: radiant heat levels of greater than 10kW/m² (1200K) are not experienced by emergency service personnel and occupants during firefighting and emergency management around a building on site that can be used as a refuge.** | > an APZ is provided in accordance with Table 19 in Appendix 1 of this document around the entire refuge building or structure. |
| **Manufactured home estates: APZs achieve radiant heat levels that are commensurate with the construction standard for the proposed dwellings.** | > an APZ in accordance with Table 19 in Appendix 1 of this document is provided to all new dwellings; or<br>> an APZ in accordance with Table 20 in Appendix 1 of this document is provided where it is demonstrated that all new dwellings will be constructed in accordance with BAL-29. |
| **LANDSCAPING** | |
| > **landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.** | > landscaping is in accordance with Appendix 4; and |
| **CONSTRUCTION STANDARDS** | |
| > **the proposed building can withstand bush fire attack in the form of wind, embers, radiant heat, and flame contact.** | > a construction level of BAL-12.5 (or BAL-19 for class 9 buildings) under AS 3959 or NASH Standard. |
| **VARIATIONS** | |
| **Camping and primitive camping: no performance criteria applicable.** | > N/A. |
| **Bed and breakfast and farm stay: the proposed building can withstand bush fire attack in the form of wind, embers, radiant heat, and flame contact.** | > construction is applied in accordance with Appendix 1 of BMS. |
| **Ecotourism: the proposed refuge building can withstand bush fire attack in the form of wind, embers, radiant heat, and flame contact.** | > a construction level of BAL-12.5 or greater is applied to the refuge building in accordance with AS 3959 or NASH Standard. |

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| **Manufactured home estates: the proposed manufactured home can withstand bush fire attack in the form of wind, embers, radiant heat, and flame contact.** | > Where an APZ is provided in accordance with Table 19 in Appendix 1 of this document the construction standards for BAL-12.5 shall apply; or<br>> Where an APZ is provided in accordance with Table 20 in Appendix 1 of this document the construction standards for BAL-29 shall apply. |
| **Ecotourism** | |
| **occupants of the ecotourism facility are provided with appropriate shelter in the event of a bush fire.** | > a refuge building is provided.<br>> the refuge building must have sufficient space for all occupants and comply with the occupancy levels permissible for that structure; and<br>> the refuge building must be constructed to BAL-12.5 or greater in accordance with AS 3959 or NASH Standard. |

All APZ modelling for the purposes of Sensitive use development is based on a flame temperature of 1200 Kelvin (K).

### 6.7.2 Access

**Intent of measures:** to provide safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area.

**Table 8. Performance criteria and acceptable solutions for access for Sensitive use development.**

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| **ACCESS** | |
| > **firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.** | > sensitive use development access roads are two-wheel drive, all-weather roads.<br>> access is provided to all structures.<br>> traffic management devices are constructed to not prohibit access by emergency services vehicles.<br>> access roads must provide suitable turning areas in accordance with Appendix 3; and<br>> one way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression. |
| **VARIATIONS** | |
| **Primitive camping: Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.** | > access is provided in accordance with the property access requirements of Table 4. |
| **Bed and breakfast and farm stay: Firefighting vehicles are provided with safe, all-weather access to structures.** | > access is provided in accordance with the property access requirements of Table 4. |

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| **Ecotourism: fire fighting vehicles are provided with safe, all-weather access to the proposed refuge building.** | > vehicular access is provided to the refuge building from a public road in accordance with property access requirements of Table 4.<br>> accommodation is within 100m of the refuge building; and<br>> pedestrian paths from accommodation to the refuge building/s are provided and clearly signposted. |
| > **the capacity of access roads is adequate for firefighting vehicles.** | > the capacity of road surfaces and any bridges/ causeways is sufficient to carry fully loaded firefighting vehicles. |
| > **there is appropriate access to water supply.** | > hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression.<br>> hydrants are provided in accordance with the relevant clauses of AS 2419.1 and ESA requirements; and<br>> there is suitable access for a fire appliance to within 4m of the static water supply where no reticulated supply is available. |
| **PERIMETER ROADS** | |
| > **perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.** | > there are two-way sealed roads.<br>> minimum 7.5m carriageway width kerb to kerb; parking is provided outside of the carriageway width; hydrants are to be located clear of parking areas.<br>> there are through roads, and these are linked to the internal road system at an interval of no greater than 500m.<br>> curves of roads have a minimum inner radius of 6m.<br>> the maximum grade road is 15 degrees and average grade of not more than 10 degrees.<br>> the road crossfall does not exceed 3 degrees; and<br>> a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided. |
| **NON-PERIMETER ROADS** | |
| > **non-perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating.** | > minimum 5.5m carriageway width kerb to kerb.<br>> parking is provided outside of the carriageway width; hydrants are located clear of parking areas.<br>> there are through roads, and these are linked to the internal road system at an interval of no greater than 500m.<br>> curves of roads have a minimum inner radius of 6m.<br>> the maximum grade road is 15 degrees and average grade of not more than 10 degrees.<br>> the road crossfall does not exceed 3 degrees; and<br>> a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided. |

### 6.7.3 Services – Water, gas, and electricity

**Intent of measures:** to provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building.

**Table 9. Performance criteria and acceptable solutions for water, electricity, and gas services for Sensitive use development.**

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| **WATER SUPPLIES** | |
| > **an adequate water supply for firefighting purposes is installed and maintained.** | > reticulated water is to be provided to the development, where available; or<br>> a 10,000 litres minimum static water supply for firefighting purposes is provided for each occupied building where no reticulated water is available. |
| **VARIATIONS** | |
| **Caravan and camping grounds: an adequate water supply for firefighting purposes is installed and maintained.** | > either a reticulated water supply is provided or a 10,000 litres minimum water supply on site. |
| **Primitive camping: an adequate water supply for firefighting purposes is installed and maintained.** | |
| > **water supplies are located at regular intervals.**<br>> **the water supply is accessible and reliable for firefighting operations.** | > fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1 and ESA requirements.<br>> hydrants are not located within any road carriageway; and<br>> reticulated water supply to sensitive use developments uses a ring main system for areas with perimeter roads. |
| > **flows and pressure are appropriate.** | > fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1 and ESA requirements. |
| > **the integrity of the water supply is maintained.** | > all above-ground water service pipes external to the building are metal, including and up to any taps. |
| > **water supplies are adequate in areas where reticulated water is not available.**<br>> **water supplies are adequate in areas where reticulated water is not available.** | > a connection for firefighting purposes is located within the IAPZ or non-hazard side and away from the structure; a 65mm Storz outlet with a ball valve is fitted to the outlet.<br>> ball valve and pipes are adequate for water flow and are metal.<br>> supply pipes from tank to ball valve have the same bore size to ensure flow volume.<br>> underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank.<br>> a hardened ground surface for truck access is supplied within 4m of the access hole.<br>> above-ground tanks are manufactured from concrete or metal.<br>> raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F AS 3959).<br>> unobstructed access is always provided. |

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| | > tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters; and<br>> underground tanks are clearly marked, all exposed water pipes external to the building are metal, including any fittings.<br>> where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; Any hose and reel for firefighting connected to the pump shall be 19mm internal diameter; and<br>> fire hose reels are constructed in accordance with AS/NZS 1221:1997 Fire hose reels and installed in accordance with the relevant clauses of AS2441:2005 *Installation of fire hose reels*. |
| **ELECTRICITY SERVICES** | |
| > **location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.** | > where practicable, electrical transmission lines are underground.<br>> where overhead, electrical transmission lines are proposed as follow:<br>• lines are installed with short pole spacing (30m), unless crossing gullies, gorges, or riparian areas; and<br>• no part of a tree is closer to a power line than the distance set out in https://www.evoenergy.com.au/residents/trees-and-powerlines |
| **GAS SERVICES** | |
| > **location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.** | > reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used.<br>> all fixed gas cylinders are kept clear of all flammable materials to 10m and shielded on the hazard side.<br>> connections to and from gas cylinders are metal.<br>> if gas cylinders need to be kept close to the building, safety valves are directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion.<br>> polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used; and<br>> above-ground gas service pipes external to the building are metal, including and up to any outlets. |

### 6.7.4 Emergency management planning

**Intent of measures:** to provide suitable emergency and evacuation arrangements for occupants of sensitive use developments.

**Table 10. Performance criteria and acceptable solutions for emergency management plans for Sensitive use development.**

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| **EMERGENCY MANAGEMENT** | |
| > **a Bush Fire Emergency Management and Evacuation Plan is prepared.** | > Bush Fire Emergency Management and Evacuation Plan is prepared consistent with the:<br>• The NSW RFS document: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan*.<br>• Australian Standard AS 3745:2010 *Planning for emergencies in facilities*; and<br>• Australian Standard AS 4083:2010 *Planning for emergencies – Health care facilities* (where applicable).<br>> the Bush Fire Emergency Management and Evacuation Plan should include planning for the early relocation of occupants.<br>Note: A copy of the Bush Fire Emergency Management and Evacuation Plan should be provided to ACT ESA for its information prior to occupation of the development. |
| **VARIATIONS** | |
| **Caravan and camping grounds: a Bush Fire Emergency Management and Evacuation Plan is prepared.**<br><br>Primitive camping: **a Bush Fire Emergency Management and Evacuation Plan is prepared.**<br><br>Ecotourism: **A Bush Fire Emergency Management and Evacuation Plan is prepared.** | > a Bush Fire Emergency Management and Evacuation Plan is prepared consistent with the NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan, and AS 3745:2010.<br>> for proposals in isolated or remote areas which involve large travel distances through bush fire prone vegetation, the following issues should be determined and addressed:<br>• the amount of travel likely to be generated during an emergency evacuation.<br>• the capacity of the broader road network to facilitate safe emergency evacuation.<br>• limitations/constraints inherent in the road system; and<br>• management of potential traffic conflicts (such as emergency vehicles versus evacuating members of the community).<br>> the Bush Fire Emergency Management and Evacuation Plan must consider a mechanism for the early relocation of occupants on days when adverse fire weather is notified, or adverse fire activity occurs in the local government area in which the development operates.<br>Note: A copy of the Bush Fire Emergency Management and Evacuation Plan shall be provided to ACT ESA for its information prior to occupation of the development. |
| > **appropriate and adequate management arrangements are established for consultation and implementation of the Bush Fire Emergency Management 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; and<br>> detailed plans of all emergency assembly areas including on-site, and off-site arrangements as stated in AS 3745:2010 are clearly displayed, and an annually emergency evacuation is conducted. |

# SECTION 7. RESIDENTIAL INFILL DEVELOPMENT

Residential and rural residential infill development refers to the development of land by the erection of, alteration or addition to, a dwelling which does not require the spatial extension of services including public roads, electricity, water, or sewerage and is within an existing lot.

## 7.1 INTRODUCTION

Existing development in the ACT may not have provided BPMs at the time of original development in accordance with this document. These types of development can therefore benefit the most by including BPMs when redevelopment occurs. These development sites also benefitted from the implementation of APZ's from 2004 onwards irrespective of the adjacent environment. The Environment can also benefit from the inclusion of appropriate BPM's when redevelopment occurs.

All development within the BPA must comply with the BMS. Residential infill developments will be considered in accordance with the acceptable solutions and performance criteria specified in Section 7.4.

For other types of residential development, including dual occupancy, granny flats and multi- unit residential developments, please refer to Section 8.

Inner asset protection zones on public land, as mapped by the ESA, may be included in the assessment of residential infill development but must be approved by ACT ESA in consultation with the appropriate land manager during the DA process. These IAPZ's were developed using the previous ACT Bushfire Management Standards, using a system called Asset interface classification (AIC). The tables for determining the AIC and the associated APZ's can be found in tables 11, 12 and 13. Tables 11, 12 and 13 are for reference only. No new APZ's are to be designed using this system.

**Table 11 Asset Interface Classification matrix**

| | Length if fire run to asset interface (meters) | | |
|---|---|---|---|
| **Aspect of fire run** | <100 | 100-350 | >350 |
| North | Secondary | Primary | Primary |
| Northeast | Secondary | Primary | Primary |
| West | Secondary | Primary | Primary |
| Southwest | Lee | Secondary | Primary |
| South | Lee | Secondary | Secondary |
| Southeast | Lee | Lee | Lee |
| East | Lee | Lee | Secondary |
| Northeast | Lee | Lee | Secondary |

**Table 12 Widths for Inner and Outer Asset Protection Zones (APZs)**

| Vegetation Type | Asset Interface Classification (as mapped) | Inner APZ | Outer APZ |
|---|---|---|---|
| | | Width (m) | Width (m) |
| Forest and woodland | Primary | 30 | Target 300; minimum 200 |
| | Secondary | 20 | 100 |
| | Lee | 10 | 0 |
| Grass and open woodland | Primary | 30 | 100 |
| | Secondary | 20 | 0 |
| | Lee | 10 | 0 |

**Table 13 Width for Inner APZs (with no Outer APZ)**

| Vegetation Type | Asset Interface Classification (as mapped) | Inner APZ | Outer APZ |
|---|---|---|---|
| | | Width (m) | Width (m) |
| Forest and woodland | Primary | 60 | 0 |
| | Secondary | 40 | 0 |
| | Lee | 20 | 0 |
| Grass and open woodland | Primary | 40 | 0 |
| | Secondary | 20 | 0 |
| | Lee | 10 | 0 |

In most cases, residential infill development proposals will be constrained by:

- existing lot size.
- existing subdivision patterns.
- existing access and water provisions; and
- existing built forms surrounding the subject site.

Where a development expectation arises from the zoning of the land to build, rebuild, alter, or add to a dwelling in pre-existing subdivisions, attempts should be made to find a solution considering the level of risk present. The expectation of building or altering a house is recognised even though the ability to provide for APZs or access requirements now required for residential development may not be possible.

## 7.2 HOME-BASED OCCUPATIONS

Home-based occupations may occur within existing dwellings. Some home-based occupations include more occupants that are less familiar with their surroundings and may require increased protection.

### 7.2.1 Home-based childcare

Home-based childcare is considered differently to a commercial childcare facility. These facilities have specific requirements, as they have some distinct differences to Sensitive use development:

- they have an established limit to the number of occupants.
- they are required to submit evacuation information prior to licensing, which details the procedures for safe evacuation of all occupants during an emergency.
- At least one person on site is a resident and should therefore be aware of the bush fire risk and evacuation procedure.
- there is a different ratio of staff to occupants than other sensitive use developments.

## 7.3 SPECIFIC OBJECTIVES

Proposals for residential infill development are to:

- provide a defendable space to enable unimpeded access for firefighting around the building.
- provide better bush fire outcomes on a redevelopment site than currently exists, commensurate with the scale of works proposed.
- design and construct buildings commensurate with the bush fire risk.
- provide access, services, and landscaping to aid firefighting operations.
- not impose an increased bush fire management and maintenance responsibility on adjoining landowners; and
- increase the level of bush fire protection to existing dwellings based on the scale of the proposed work and level of bush fire risk.

## 7.4 BUSH FIRE PROTECTION MEASURES

The BPMs for residential and rural residential infill development include provisions relating to APZs, access, water supply, electricity and gas services, construction standards, landscaping, and emergency evacuation. To create appropriate separation between a dwelling and the bush fire hazard, APZs commensurate with those specified for new subdivision must be provided. The acceptable solutions for residential development proposals need to comply with Table 20. Applications proposing BAL-40 and BAL- FZ construction are performance-based.

**Intent of measures:** to minimise the risk of bush fire attack and provide protection for emergency services personnel, residents and others assisting firefighting activities.

**Table 14 Performance criteria and acceptable solutions for residential and rural residential infill development.**

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| **ASSET PROTECTION ZONES** | |
| > **APZs are provided commensurate with the construction of the building; and**<br>> **A defendable space is provided.** | > an APZ is provided in accordance with Table 20 in Appendix 1. |
| > **APZs are managed and maintained to prevent the spread of a fire to the building.** | > APZs are managed in accordance with the requirements of Appendix 4 of BMS. |
| > **the APZ is provided in perpetuity.**<br>> **APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.** | > IAPZs are wholly within the boundaries of the development site unless the adjacent land is mapped as IAPZ by the ESA. Consultation with ESA required.<br>> APZ are located on lands with a slope less than 14 degrees. |
| > **Home-based childcare: the building must not be exposed to radiant heat levels exceeding 29kW/m² (1090K).** | > an APZ is provided in accordance with Table 20 in Appendix 1. |
| **ACCESS** | |
| > **firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.** | > property access roads are two-wheel drive, all- weather roads. |
| > **the capacity of access roads is adequate for firefighting vehicles.** | > the capacity of road surfaces and any bridges/ causeways is sufficient to carry fully loaded firefighting vehicles. |
| > **there is appropriate access to water supply.** | > hydrants are provided in accordance with the relevant clauses of AS 2419.1 and ESA requirements.<br>> There is suitable access for a fire appliance to within 4m of the static water supply where no reticulated supply is available. |
| > **firefighting vehicles can access the dwelling and exit the property safely.** | > at least one alternative property access road is provided for individual dwellings or groups of dwellings that are located more than 200 metres from a public through road.<br>> There are no specific access requirements in an urban area where an unobstructed path (no greater than 70m) is provided between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles.<br>> In circumstances where this cannot occur, the following requirements apply:<br>• minimum 4m carriageway width.<br>• in forest, woodland and heath situations, rural property roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m, at the passing bay.<br>• a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.<br>• property access must provide a suitable turning area in accordance with Appendix 3. |

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| | • curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress.<br>• the minimum distance between inner and outer curves is 6m.<br>• the crossfall is not more than 10 degrees.<br>• maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads.<br>Note: Some short constrictions in the access may be accepted where they are not less than 3.5m wide, extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above. |
| **WATER SUPPLIES** | |
| > **an adequate water supply is provided for firefighting purposes.** | > reticulated water is to be provided to the development, where available; and<br>> a static water supply is provided where no reticulated water is available. |
| > **water supplies are located at regular intervals; and**<br>> **the water supply is accessible and reliable for firefighting operations.** | > fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1 and ESA requirements.<br>> hydrants are not located within any road carriageway; and<br>> reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads. |
| > **flows and pressure are appropriate.** | > fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1 and ESA requirements |
| > **the integrity of the water supply is maintained.** | > all above-ground water service pipes external to the building are metal, including and up to any taps. |
| > **a static water supply is provided for firefighting purposes in areas where reticulated water is not available.** | > where no reticulated water supply is available, water for firefighting purposes is provided in accordance with Table 6.<br>> a connection for firefighting purposes is located within the IAPZ or non-hazard side and away from the structure; 65mm Storz outlet with a ball valve is fitted to the outlet.<br>> ball valve and pipes are adequate for water flow and are metal.<br>> supply pipes from tank to ball valve have the same bore size to ensure flow volume.<br>> underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank.<br>> a hardened ground surface for truck access is supplied within 4m.<br>> above-ground tanks are manufactured from concrete or metal.<br>> raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F of AS 3959).<br>> unobstructed access can be always provided.<br>> underground tanks are clearly marked.<br>> tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters.<br>> all exposed water pipes external to the building are metal, including any fittings.<br>> where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; any |

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| | hose and reel for firefighting connected to the pump shall be 19mm internal diameter; and<br>> fire hose reels are constructed in accordance with AS/NZS 1221:1997 and installed in accordance with the relevant clauses of AS 2441:2005. |
| **ELECTRICITY SERVICES** | |
| > **location and design of electrical services will not lead to ignition of surrounding bushland or the fabric of buildings.** | > where practicable, electrical transmission lines are underground; and<br>> where overhead, electrical transmission lines are proposed as follows:<br>• lines are installed with short pole spacing (30m), unless crossing gullies, gorges, or riparian areas; and<br>• no part of a tree is closer to a power line than the distance set out in accordance with the specifications in https://www.evoenergy.com.au/residents/trees-and-powerlines |
| **GAS SERVICES** | |
| > **location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.** | > reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used.<br>> all fixed gas cylinders are kept clear of all flammable materials to 10m and shielded on the hazard side.<br>> connections to and from gas cylinders are metal.<br>> polymer-sheathed flexible gas supply lines are not used; and<br>> above-ground gas service pipes are metal, including and up to any outlets. |
| **CONSTRUCTION STANDARDS** | |
| > **the proposed building can withstand bush fire attack in the form of embers, radiant heat, and flame contact.** | > BAL is determined in accordance with Table 21; and<br>> construction provided in accordance with the NCC for buildings in bushfire prone areas |
| > **proposed fences and gates are designed to minimise the spread of bush fire.** | > fencing and gates are constructed in accordance with Section 7.5. |
| > **proposed Class 10a buildings are designed to minimise the spread of bush fire.** | > Class 10a buildings are constructed in accordance with Section 8.3.2. |
| **Home-based childcare: the proposed building can withstand bush fire attack in the form of wind, localised smoke, embers and expected levels of radiant heat.** | > an APZ is provided in accordance with Table 20 in Appendix 1 of this document around the entire building or structure; and<br>> the existing dwelling is required to be upgraded to improve ember protection. This is to be achieved by enclosing or covering openings with a corrosion-resistant steel, bronze, or aluminium mesh with a maximum aperture of 2mm. Where applicable this includes the openable portion of the windows, vents, weepholes, and eaves, but does not include roof tile spaces. Weather strips, draught excluders or draught seals shall be installed at the base of side hung external doors as per AS 3959. The subfloor space must be enclosed. |

| PERFORMANCE CRITERIA | ACCEPTABLE SOLUTIONS |
|---|---|
| The intent may be achieved where: | |
| **LANDSCAPING** | |
| > **landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.** | > compliance with the ACTESA 'Asset protection zone standards' (see Appendix 4).<br>> a clear area of low-cut lawn or pavement is maintained adjacent to the house.<br>> fencing is constructed in accordance with Section 7.5; and<br>> trees and shrubs are located so that: |
| **EMERGENCY MANAGEMENT** | |
| > **Home-based childcare: a bush fire emergency and evacuation management plan are prepared.** | > a Bush Fire Emergency Management and Evacuation Plan is prepared by the operator consistent with the NSW RFS publication: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan*, and the AS 3745:2010. |

Note: the above specifications and requirements apply in relation to residential infill developments but may be used to guide the application of BPMs for 'other' developments (see Section 8).

## 7.5 FENCES AND GATES

Fences and gates in bush fire prone areas may play a significant role in the vulnerability of structures during bush fires. In this regard, all fences in bush fire prone areas should be made of either hardwood or non-combustible material.

However, in circumstances where the fence is within 6m of a building or in areas of BAL-29 or greater, they should be made of non-combustible material only.

## 7.6 DETERMINATION OF THE BAL

The modelling procedure for the assessment of the BAL in BMS uses the input values and the Detailed Method for Determining the BAL - Method 2 in AS 3959.

The BAL tables in Appendix 1 replace the tables in AS 3959 in ACT.

## 7.7 BETTER BUSH FIRE OUTCOMES

Where an alteration and addition are proposed to a dwelling where the existing building has little or no BPMs incorporated into its design, consideration must be given to upgrading the existing structure.

The new works are required to comply with the National Construction Code (NCC). Consideration should be given to whether strict compliance with the NCC is the best outcome for the property or whether a more balanced holistic outcome that addresses the entire building is more appropriate.

Where it is determined that strict compliance with the NCC for the alterations and additions is not the best outcome for the site, a full performance-based solution should be prepared. The performance-based solution should address the best bush fire protection solution for the entire site and seek to apply BPMs in combination.

The BFDB process may be the most appropriate way of determining the criteria for this kind of proposal (refer to Appendix 2).

Where it is not demonstrated and agreed that the proposal is the best outcome for the site, strict compliance with the NCC will be required.

## 7.8 GRASSLAND DEEMING PROVISIONS

The risk posed by grass fires is different to that of fires in other vegetation types. Grass fires burn at a higher intensity and spread more rapidly with a shorter residence time. Embers produced by grass fires are smaller and fewer in number than those produced from forest fires.

In recognition of the characteristics of grassland fire behaviour, the ACT ESA has developed a simplified set of Deeming Provisions for residential and rural residential infill development. This process provides another acceptable set of simple requirements for residential and rural residential infill development located in a grassland hazard area. A site assessment as detailed in Appendix 1 is not required, nor is referral to the ACT ESA.

Where an APZ of 50m can be provided, no further BPMs are required. Where an APZ of 20-49m can be provided, the set of provisions shown in Table 14 apply. However, where the Grassland Deeming Provisions cannot be achieved or a merit-based approach is desired, the standard assessment process outlined in Appendix 1 must be adopted. The maximum slope for the Deeming Provisions is restricted to 15 degrees downslope of the asset.

Note: Please note that GFDI and not FFDI values apply to grassland areas. The GFDI values shown in Table 2 has been used to calculate the APZ distances for grassland areas in Appendix 1 and shall also be used for relevant performance-based solutions.

The deeming provisions and the residential and rural residential infill development APZ tables are derived from different methodologies, however both are considered compliant outcomes.

**Table 15 Grassland Deeming Provisions**

| BUSH FIRE PROTECTION MEASURE | GRASSLAND DEEMING PROVISIONS |
|---|---|
| **APZ** | > limited to a maximum of 15 degrees downslope of the asset (see figure 6).<br>> minimum APZ of 20m is provided between the building and the hazard.<br>> the APZ is wholly within the boundaries of the development site; and<br>> the APZ is maintained as a mown area with grass heights less than 200mm. |
| **Construction** | > construction in accordance with BAL-12.5 of AS 3959 |
| **Access** | > comply with the property access provisions in Table 4. |
| **Water supply** | > comply with the water supply provisions in Table 14. |
| **Landscaping** | > comply with the relevant provisions in Appendix 4, noting that other vegetation bush fire hazards cannot be present if these provisions are to apply. |

# SECTION 8. OTHER DEVELOPMENT

Other development refers to any type of development that is not covered by Sections 5 to 7 of this document. This includes commercial uses, industrial uses, infrastructure, and development which involves large numbers of people.

## 8.1 INTRODUCTION

There are other developments where bush fire provisions or requirements need to be applied, that align with the unique features of the development type.

To comply with BMS the following conditions must be met:

- satisfy the aim and objectives of BMS outlined in Section 1.
- consider any issues listed for the specific purpose for the development set out in this section; and
- propose an appropriate combination of BPMs.

It is important to ensure that a defendable space is provided for the size and scale of the development. Proposed measures must operate in combination to minimise the impact of bush fire and ensure that access and services are adequate.

## 8.2 OTHER RESIDENTIAL DEVELOPMENT

Residential development, other than single dwellings and subdivisions, covered in this section must also meet the requirements of Section 7.

### 8.2.1 Increased residential densities

In some situations, increased densities may not be appropriate having regard to the strategic principles, even though zoning has been approved for the proposed use. A Bush Fire Design Brief may be required for these proposals.

Increased resident densities of existing lots that are bush fire prone may heighten the level of risk to the occupants. The presence of additional dwellings can impact on the evacuation and sheltering of residents during a bush fire.

Where a new dwelling or dwellings are proposed on existing lots which already contain one or more dwellings, this is an increase in residential density and can include the following:

- dual occupancy.
- multi-dwelling housing.
- secondary dwellings.
- rural workers dwellings; and
- boarding houses.

This increase in residential density does not necessarily require a subdivision approval. However, the same principles and criteria associated with subdivisions in bush fire prone areas will apply. This includes ensuring an APZ based on a radiant heat threshold of 29kW/m² for any new dwellings, along with suitable provision for construction, access, water, and landscaping.

Where there is an existing dwelling within the subject site and a second building can otherwise comply with the provisions of this document, it may be necessary to upgrade the existing dwelling to provide:

- ember protection.

- improved water availability.
- suitable access; and
- APZs.

### 8.2.2 Multi-storey residential development

Buildings exceeding three storeys in height are multi-storey buildings. The rise in storeys shall be calculated as per the definition in Volume 1 of the NCC.

Multi-storey buildings are required to comply with the performance criteria within Section 5, including the requirement for an APZ which meets a threshold of 29kW/m². There are additional considerations associated with multi-storey residential buildings and the key issues are as follows:

- Population - higher resident densities can pose issues for emergency management.
- Location – bush fire impacts can be increased where high rise buildings are in higher elevations or on ridge tops.
- Egress - is more challenging and places an increased demand on road infrastructure during evacuation.
- Construction - there is a higher external façade surface area that may be exposed to bush fire attack and:
  - car and storage facilities on the ground level can provide an additional fuel loading.
  - balconies and external features can easily trap embers which can ignite combustible materials.
- Height -the height can result in increased exposure to convective heat.

In addition to the requirements in Section 5, Table 16 provides the considerations for multi- storey buildings in bush fire prone areas to ensure that the design of a building and its warning and suppression system adequately address bush fire risk.

**Table 16 Issues and considerations specific to multi-storey residential development.**

| ISSUE | SPECIFIC CONCERN | TECHNICAL CONSIDERATIONS |
|---|---|---|
| **Population** | > Impact on existing community and infrastructure. | > What capacity does the existing infrastructure have to allow evacuation of existing and proposed residents in the event of a bush fire? |
| **Location of Building** | > Locating on ridge tops emphasises the risk of convective plume interaction and wind related impacts. | > Can the building be located away from ridge tops to areas that have a reduced bush fire exposure?<br>> If unavoidable, what is the impact on the risk to the building?<br>> Is this risk appropriate for the building and occupant numbers? |
| **Design Fire** | > Different elements of the flame could have different impacts on different levels of the building; and<br>> The whole building could be impacted by ember attack and multiple floors could be alight simultaneously. | > What are the flame dimensions, including the flame angle?<br>> Where is the hottest part of the flame located? How would this impact on the proposed building?<br>> How would the warning and suppression systems in the building cope with this? |
| **Egress** | > Elevations exposed to bush fire risk. | > How does the emergency evacuation procedure take account of the location of bush fire prone vegetation? |
| **Building construction** | > Performance of the building façade in a bush fire scenario.<br>> Balconies may contain external features which could ignite and contribute to building ignition and fuel loads. | > What wall and cladding materials are proposed and what is proposed for the openings/penetrations (i.e., windows and doors)?<br>> How does the proposed building construction deal with fire spread from the vegetation to the inside of the building?<br>> Is compliance with AS 3959 sufficient to ensure that the bush fire risk is mitigated?<br>> Is this appropriate for the design fire scenario?<br>> Are there balconies proposed?<br>> What may be stored on the balconies?<br>> Can there be restrictions on what is stored on the balconies due to fire risk? |
| **Car Parking** | > Lower storey car park could be subject to ember attack and high radiant heat loads. | > Is the warning and suppression system designed to take account of bush fire impact?<br>> Where are exits located? Are they guiding occupants away from the car park? |
| **Other Considerations** | > Access for fire fighters may be restricted or challenging; and<br>> Risk implications of floor-to-floor fire spread. | > What would this mean for fire suppression?<br>> How would warning and suppression systems take account of this?<br>> What would this mean for evacuation? |

Because of the challenges that multi-storey buildings pose when located in bush fire prone areas, a performance-based solution should be prepared which will include a BFDB. Heads of consideration for the performance-based solution include the following:

- **Location** – multi-storey buildings should not be located along ridges or slopes with significant fire runs.
- **Existing infrastructure** – when multi-storey developments are proposed, the fire protection provided during potential bush fire emergencies needs to be considered, particularly in terms of evacuating occupants along the road network and the availability of water supplies for firefighting.
- **External facades** – these may be subject to an increased exposure to radiant heat and convection columns. Modelling may be needed and APZs may need to be increased over and above those specified to account for this.
- **Egress** – the risk associated with occupant egress is higher in multi-storey buildings than for lower- rise structures and therefore adequate emergency egress during a bush fire emergency should be addressed.

Such developments should only be considered on BPA if an analysis based on the requirements of Section 5, can demonstrate that the above issues do not pose an unacceptable risk.

### 8.2.3 Historic buildings

In relation to buildings identified as having heritage significance, the usual requirements for bush fire protection may conflict with the conservation of significant heritage fabric and/or its setting. Development affecting heritage issues and related requirements, should be considered on an individual basis.

The application of BMS is to be considered in the context of the conservation principles, processes, and practices of the Illustrated Burra Charter (Australia ICOMOS, 2013).

The development of a suitable bush fire safety proposal that considers constraints of heritage issues may require a performance-based solution and therefore may require a BFDB.

## 8.3 OTHER NON-RESIDENTIAL DEVELOPMENT

Other non-residential development includes development that is not used for residential purposes or may have a dual usage.

### 8.3.1 Buildings of Class 5 to 8 under the NCC

Under the building classification system within the NCC, Class 5 to 8 buildings include offices, shops, factories, warehouses, public car parks and other commercial and industrial facilities. Where no residential component is included, commercial and industrial development is addressed through the aim and objectives of BMS (see Section 1 of this document).

The NCC does not provide for any bush fire specific performance requirements for these classes of buildings. As such AS 3959 and the NASH Standard are not considered as a set of Deemed to Satisfy provisions, however compliance with AS 3959 and the NASH Standard must be considered when meeting the aims and objectives of BMS. A suitable package of BPMs should be proposed commensurate with the assessed level of risk to the development. The scale of the development and numbers of people likely to be occupying the building will be directly relevant to the BPMs proposed. The provisions within Section 7 of this document should be used as a base for the development of a package of measures. Each development will be assessed on its own individual merits.

Whilst bush fire is not captured in the NCC for Class 5-8 buildings, the following objectives will be applied in relation to access, water supply and services, and emergency and evacuation planning:

- to provide safe access to/from the public road system for firefighters providing property protection during a bush fire and for occupant egress for evacuation.
- to provide suitable emergency and evacuation (and relocation) arrangements for occupants of the development.
- to provide adequate services of water for the protection of buildings during and after the passage of bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building; and

- provide for the storage of hazardous materials away from the hazard wherever possible.

The general fire safety construction provisions of the NCC are taken as acceptable solutions however construction requirements for bush fire protection will need to be considered on a case-by-case basis.

Where a mixed-use development is proposed to have a sensitive use development component, an appropriate mix of BPMs should be applied consistent with the sensitive use development provisions in Section 6.

### 8.3.2 Class 10 structures

The NCC defines a Class 10 building as a non-habitable building or structure such as a:

- Class 10a – a non-habitable building being a private garage, carport, shed or the like; or
- Class 10b – a structure being a fence, mast, antenna, retaining or free-standing wall, swimming pool, or the like; or
- Class 10c – a private bush fire shelter

There are no bush fire protection requirements for Class 10a buildings located more than 6m from a dwelling in bush fire prone areas. Where a Class 10a building is located within 6m of a dwelling it must be constructed in accordance with the NCC.

### 8.3.3 Private bush fire shelters

Under the NCC, a private bush fire shelter is a Class 10c structure "associated with, but not attached to, or part of a Class 1a dwelling that may, as a last resort, provide shelter for occupants from immediate life-threatening effects of a bush fire" (NCC 2019).

Regardless of the level of bush fire attack, all private bush fire shelters need to comply with Performance Requirement P2.7.6 of the NCC. The Performance Standard for Private Bushfire Shelters published by the Australian Building Codes Board (ABCB) in 2014 provides guidance in demonstrating compliance with the Performance Requirement. Where it is proposed to construct a private bush fire shelter compliance is required with Table 2.4 – Acceptance Criteria of the Performance Standard for Private Bushfire Shelters 2014.

In addition, design and construction of a private bush fire shelter must be informed by appropriately qualified and experienced practitioners. Given the life safety risks that an inadequately designed and poorly maintained private bush fire shelter can present to occupants, a conservative approach to this matter is required.

Although the Performance Standard for Private Bushfire Shelters 2014 allows for the design and construction of private bush fire shelters based on the calculated BAL using the methodology contained in AS 3959, the ACT ESA requires that in all cases private bush fire shelters be designed for BAL-FZ.

Private bush fire shelters need to be designed on a performance basis. However, private bush fire shelters are not accepted as an offset for compliance of the dwelling with AS 3959 or the NASH Standard and the BPMs outlined in BMS.

It must be emphasised that private bush fire shelters should not be relied on as the sole answer to reducing the risk to residents in bush fire prone areas. For existing development, consideration should be given to upgrading existing buildings, increasing the separation of dwellings from bush fire hazards, and implementing other BPMs before contemplating a private bush fire shelter.

The preparation of a well thought out bush fire survival plan is pivotal to reducing the risk of loss of life during a bush fire.

### 8.3.4 Wind, solar farms, and Battery Energy Storage Systems (BESS)

Wind, solar farms, and BESS require special consideration and must be provided with adequate clearances to combustible vegetation as well as firefighting access and water. These types of developments will require engagement with ESA on a case-by-case basis before support can be given. Please contact ESA for further information.

The following must be provided for wind, solar Farms and BESS

- a minimum 20m APZ for the structures and associated buildings/infrastructure; and
- the APZ must be maintained to the standard of an IAPZ for the life of the development.

Infrastructure for the purposes of requiring APZ excludes:

- road access to the site; and
- power or other services to the site and associated fencing.

Essential equipment must be designed and housed in such a way as to minimise the impact of bush fires on the capabilities of the infrastructure during bush fire emergencies. It should also be designed and maintained so that it will not serve as a bush fire risk to surrounding bush. Where infrastructure is considered 'critical' e.g., loss of infrastructure resulting in community unable to function, the most vulnerable component of each part of a facility, critical to its continued functioning in a bushfire, is to be identified, and the Radiant Heat Flux (RHF) that each will fail at identified. APZs are to be provided to ensure the failure RHF for the critical component(s) are not exceeded, if an APZ of sufficient size is not possible, then the critical component(s) are required to be shielded, and the effectiveness of the shielding is to be appropriately demonstrated.

A Bush Fire Emergency Management and Operations Plan must identify all relevant risks and mitigation measures associated with the construction and operation of the wind, solar farm, or BESS. This should include:

- detailed measures to prevent or mitigate fires igniting.
- work that should not be carried out during total fire bans.
- availability of fire-suppression equipment, access, and water.
- storage and maintenance of fuels and other flammable materials.
- notification to ACT ESA for any works that have the potential to ignite surrounding vegetation, proposed to be carried out during a bush-fire fire danger period to ensure weather conditions are appropriate; and
- appropriate bush fire emergency management planning.

It is important to be aware of operations that may be carried out on days of Total Fire Ban and any prohibited activities or exemptions that are notified under the *Emergencies Act 2004*.

### 8.3.5 Telecommunications towers

Telecommunication sites are sites that hold infrastructure associated with mobile phones, internet, microwave radio links, trunk mobile radio or private mobile radio.

Essential telecommunication infrastructure should be designed in such a way as to minimise the impact of bush fires and ensure that communications capabilities are not compromised during bush fire emergencies. BPMs should be commensurate with the bush fire risk and criticality of the infrastructure. Where infrastructure is considered 'critical' e.g., loss of infrastructure resulting in community unable to function, the most vulnerable component of each part of a facility, critical to its continued functioning in a bushfire, is to be identified, and the Radiant Heat Flux (RHF) that each will fail at identified. APZs are to be provided to ensure the failure RHF for the critical component(s) are not exceeded, if an APZ of sufficient size is not possible, then the critical component(s) are required to be shielded, and the effectiveness of the shielding is to be appropriately demonstrated.

To determine the level of bush fire risk and to develop a suitable suite of protection measures, the ACT ESA should be consulted.

There should be a minimum APZ around the tower/ buildings/associated infrastructure which will increase based on the assessed level of risk and criticality.

Telecommunication towers should be constructed from non-combustible materials, and designed to mitigate the risk of flame damage, ember attack and radiant heat.

The APZ is only concerned with the underlying infrastructure required to support telecommunication services. These are predominately structures and buildings. Infrastructure requiring APZs does not include:

- road access to the site.
- power to the site; and
- associated fencing.

The APZ must be managed to the standard of an IAPZ. The IAPZ must be free from surface fuel and elevated fuel with minimum canopy cover.

An access strategy should be prepared that details the access arrangements for firefighting and APZ maintenance.

Generally, critical telecommunications infrastructure will be identified in a Bush Fire Risk Management Plan. Other operational planning should be undertaken for critical infrastructure associated with telecommunications.

### 8.3.6 Outdoor events in bush fire prone areas

Outdoor events often cater for large numbers of people in isolated locations, can continue over several days and may include on site accommodation. They include music festivals, cultural festivals, sporting events, and regional shows. Events that involve overnight camping, multiple days, or attract large numbers of people in high risk or isolated bush fire prone areas during the bush fire danger period require careful consideration. Such events create several logistical and operational issues if evacuation is required due to a bush fire.

Crowd control and operational access at the venue during bush fire events can prove to be challenging especially if they are held in remote locations.

Other considerations for outdoor events on BPA are outlined below:

- holding events outside the gazetted bush fire danger period for the area.
- areas of accommodation should be strategically located to ensure maximum time to warn and evacuate people who may be sleeping and slow to respond. This also ensures that highly flammable and combustible materials, such as tent fabric, vehicle fuels and gas cookers are in areas that will not facilitate the spread of fire.
- a Bush Fire Emergency Management and Evacuation Plan must be prepared that is acceptable to relevant stakeholders, including crowd management and security. It should be consistent with the NSW RFS document: A guide to developing a bush fire emergency management and evacuation plan.
- access and egress routes for emergency services and patrons if evacuation is required.
- a refuge building of suitable capacity to contain all participants and staff.
- an open-air bush fire emergency assembly area capable of accommodating all participants and staff.
- a suitable method of staging evacuation, ensuring that evacuation flow is directed through different stages/areas of the site, moving from areas of higher risk to lower risk.
- expected evacuation timeframes.
- on extreme or catastrophic fire danger rating days the event will not proceed.
- advance warning to patrons identifying that the event is located on BPA and giving advice on any fire restrictions.
- ability to cease and override P.A. and audio systems throughout the site to announce emergency warnings, alerts, or safety information, which can be clearly heard from all areas of the site; and
- a prescribed ratio of trained fire wardens to participants.

A suitable package of other protection measures should be proposed based on individual event characteristics which considers the following:

- bulk water supplies on site that are specifically allocated to firefighting purposes.
- unobstructed APZs of suitable width surrounding the site along the boundaries adjacent to the bush fire threat. Slashing of grassed areas needs to occur in the lead-up to the event and maintained throughout its duration.
- emergency management planning during the event organisation stage to be undertaken in consultation with the ACT ESA and all other relevant stakeholders; and
- fires for cooking and heating in approved fireplaces only and addressed by a Fire Management Plan.

### 8.3.7 Hazardous industry

Some developments are considered by their very nature to be hazardous, as much for their ability to start bush fires as their susceptibility to bush fire impacts. New developments of this nature should be avoided on BPA. However, where hazardous industries are proposed, prior consultation with the ACT ESA is required.

Hazardous industries include but are not limited to:

- power generating works.
- sawmills.
- junk yards.
- liquid fuel depots.
- hazardous industries/storage.
- chemical industries/storage.
- service stations.
- ammunition storage/manufacture; and
- fireworks manufacture/storage.

### 8.3.8 Public assembly buildings

Buildings used for public assembly with a floor space area of greater than 500m² are required to consider bush fire. These developments will be treated technically as sensitive use development due to the evacuation challenges presented by large numbers of occupants.

Assembly buildings can accommodate large numbers of persons of various physical capabilities. Emergency management planning for these developments must account for the total number of occupants and be commensurate with the level of risk. These developments must not experience radiant heat levels of greater than 10kW/m² on any part of the building. Assembly buildings include places of public worship.

Due to the variation in risk associated with the occupants of assembly buildings, a variety of bush fire safety solutions may apply based on the merits of the situation.

Where a public assembly building is less than 500m$^2$, general NCC fire safety and ember protection provisions must be implemented.

# APPENDIX 1. SITE ASSESSMENT METHODOLOGY

This appendix sets out the methodology to undertake a site bush fire attack assessment in relation to the application of appropriate APZs and associated construction levels.

## A1.1. APPLICATION

The following methodology must be used to determine BALs and appropriate APZs. It is the acceptable solutions methodology applicable in the ACT.

For further details on each of the steps below, see the related sections or tables in this document.

### Identify APZs

**Step 1:** Determine vegetation formation in all directions around the building to 140 metres (refer to A1.2).

**Step 2:** Determine the effective slope of the land from the building for 100 metres (refer to A1.4 and A1.5).

**Step 3:** Determine the relevant FFDI for the area in which the development is to be undertaken (refer to A1.6); and

**Step 4:** Match the relevant FFDI, vegetation formation and effective slope to determine the APZ required from the appropriate table of this Appendix (refer to A1.7).

### Identify construction requirements

**Step 1:** Follow steps 1 - 3 above.

**Step 2:** Determine the separation distance by measuring from the edge of the unmanaged vegetation to the closest external wall.

**Step 3:** Match the relevant FFDI, appropriate vegetation, distance, and effective slope to determine the appropriate BAL using Table 21; and

**Step 4:** Refer to Section 3 in AS 3959 and NASH Standard to identify appropriate construction requirements for the calculated BAL.

## A1.2. DETERMINE VEGETATION FORMATION

Identify all the vegetation formations for each aspect of the development within 140 metres of the development site or asset as per Keith (2004). This includes vegetation both within and external to the site boundaries.

Where mixes of vegetation formations are located together, the vegetation formation providing the greater hazard shall be used for the purpose of assessment. The combination of vegetation and slope that yields the worst-case scenario shall be used.

The determination of the BALs is based on a worst-case scenario and a calculation derived from maximum fuel loads. Consideration should also be given to any clearing, re-vegetation or landscaping likely to occur.

### A1.2.1. About the classification system

The vegetation classification system used within this document is based on the Keith (2004) framework. Available fuel loads are based on recent information provided by:

- The University of Wollongong's (UoW) Fuels Modelling Project.
- The University of Melbourne (UoM) which reference the fuel classifications found in Keith (2004); and
- CSIRO Ecosystems Sciences and Bushfire Dynamics and Applications.

For the purposes of bush fire assessment in the ACT, vegetation formations are as per Keith (2004) (excepting heathlands which includes two sub- formations rather than one and are based largely on vegetation height).

**Figure 5. Description of vegetation formations.**

### Rainforest

Closed and continuous complex tree canopy composed of relatively soft, horizontal-held leaves. Generally lacking in eucalypts. Understorey is typically ferns and herbs. Vines often present in canopy and/or understorey.

Occurs mainly in areas that are reliably moist, less prone to fires than sclerophyll forests and have soils of moderate to high fertility. Typically, coastal and escarpment locations.

### Wet Sclerophyll Forest

High open tree canopy dominated by tall (typically >30m), straight trunked eucalypt species. Luxuriant understorey composed of soft leaved shrubs, ferns, and herbs. Many understorey plants are rainforest species. Found on moderately fertile soils in areas of high (>900mm) rainfall.

### Dry Sclerophyll Forest

Open tree canopy dominated by eucalypt species (typically 10- 30m in height) with crowns that touch and overlap. Canopy allows most sunlight to penetrate supporting growth of a prominent understorey layer varying between hard-leaved shrubs to luxuriant soft leaved shrubs, ferns, and herbs.

### Woodland

Dominated by an open to sparse layer of eucalypts with the crowns rarely touching. Typically, 15-35m high (may be shorter at sub-alpine altitudes). Diverse ground cover of grasses and herbs. Shrubs are sparsely distributed. Usually found on flat or undulating ground.

**Grassland**

Maritime Grasslands, Temperate Montane Grasslands, Western Slopes Grassland, Riverine Plain Grasslands and Semi-arid Floodplain Grasslands.

Dominated by perennial grasses and the presence of broad-leaved herbs on flat topography. Lack of woody plants.

Plants include grasses, daisies, legumes, geraniums, saltbushes, and copper-burrs.

## A1.3. GRASSLAND ASSESSMENT

Where the vegetation formation is determined to be grassland the following applies. For all other vegetation formations please refer to A1.4-A1.7 below.

If the vegetation formation is grassland and a 20m-49m APZ can be provided, the Grassland Deeming Provisions may be applicable. There would be no need for further assessment (please refer to Section 7.8).

Where a 20m APZ cannot be provided, or a full site assessment methodology is required please refer to A1.4-A1.7 below.

Where 50m APZ can be provided, there are no further requirements.

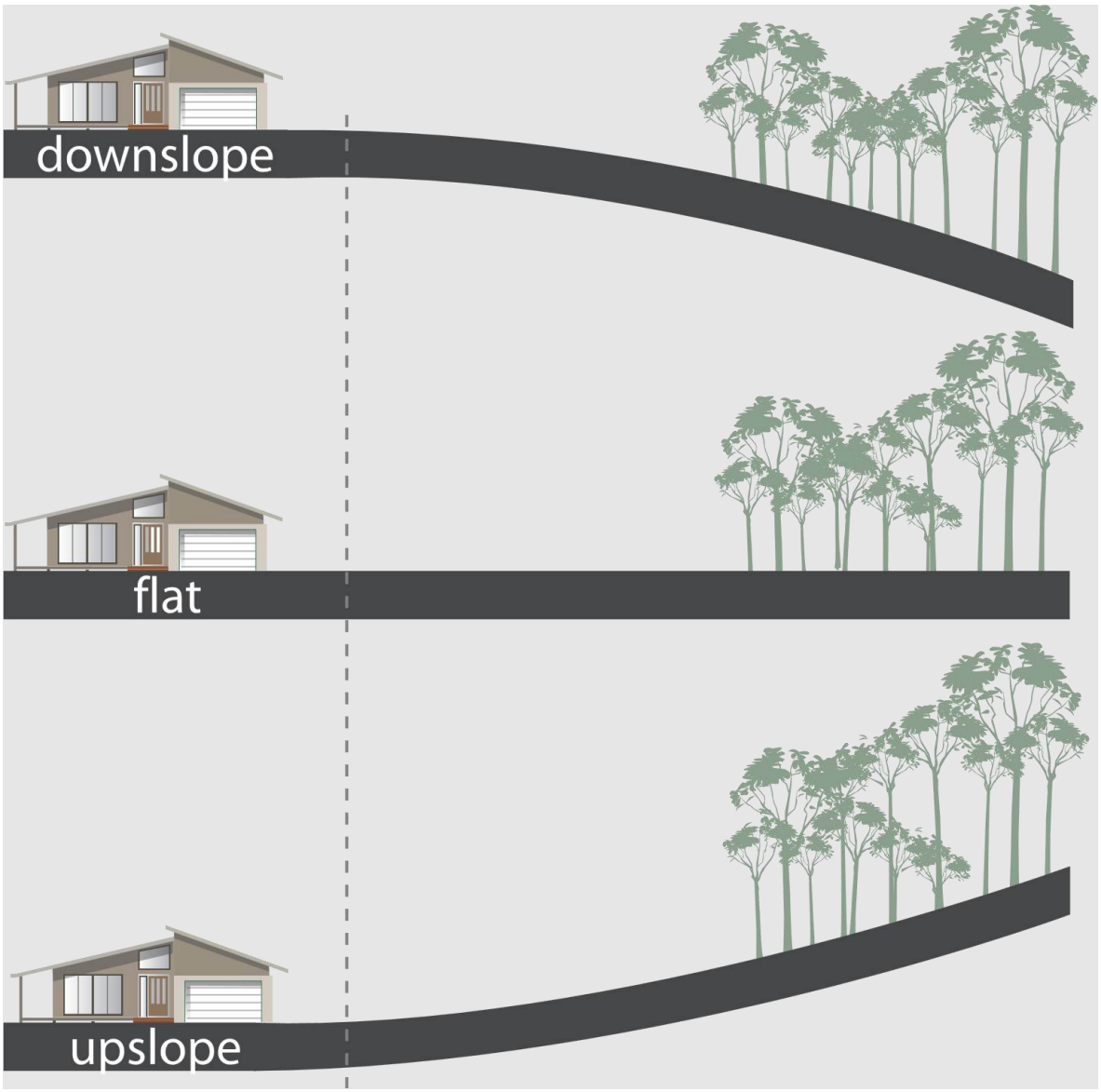
## A1.4. DETERMINE SLOPE

Slope assessment is derived from the most detailed contour data available, such as topographic maps displaying contour intervals determined when land is surveyed.

The slope is to be categorised into one of following classes, relative to the location of the hazard:

- all upslope vegetation (considered 0 degrees).
- >0 to 5 degrees downslope vegetation.
- >5 degrees to 10 degrees downslope vegetation.
- >10 degrees to 15 degrees downslope vegetation; and
- >15 degrees to 20 degrees downslope vegetation. APZ tables within BMS are provided for acceptable solutions with slopes of up to 20 degrees. Effective slopes are to be assessed with hazards on slopes more than 20 degrees will require a detailed performance assessment. This may include a consideration of the potential flame length and its impact on the proposed development. Please see Section A1.5 for information on determining the effective slope.

**Figure 6. Determine slope**



## A1.5. DETERMINE EFFECTIVE SLOPE

The slope of the land under the classified vegetation has a direct influence on the rate of fire spread, the intensity of the fire and the ultimate level of radiant heat flux.

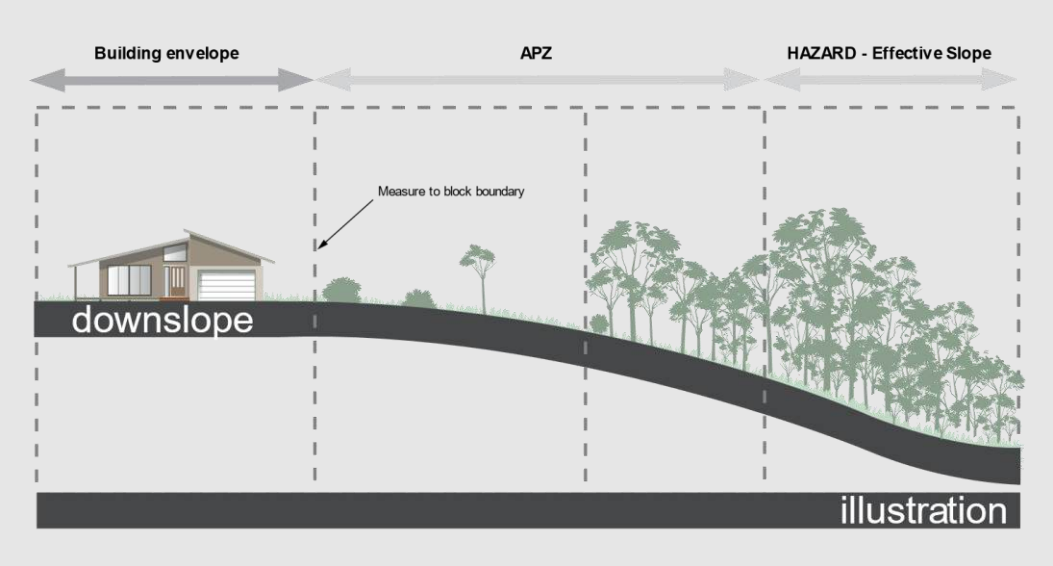
The effective slope is the slope of the ground under the hazard (vegetation). It is not the slope between the vegetation and the building (slope located between the asset and vegetation is the site slope).

In identifying the effective slope, it may be found that there are a variety of slopes covering different distances within the vegetation. The effective slope is the slope under the vegetation which will most significantly influence the bush fire behaviour for each aspect (see Figure 7 below).

This is usually the steepest slope. In situations where this is not the case, the proposed approach must be fully justified.

Vegetation located closest to an asset may not necessarily be located on the effective slope.

**Figure 7. Effective slope.**




## A1.6. DETERMINE APPROPRIATE FIRE (WEATHER) AREAS

For all development requiring an APZ, the relevant FFDI must be identified. The FFDI measures the degree of danger of fire in Australian vegetation. For the purposes of BMS, the FFDI required to be used for development assessment purposes is based on ACT government boundaries.

ACT FFDI is set at 100.

## A1.7. DETERMINE BUSH FIRE ATTACK LEVEL

Once steps A1.2-A1.6 have been completed, the APZ or Bush Fire Attack Level can be determined in Table 21. Table 17 provides a description of each Bush Fire Attack Level.

**Table 17 Radiant heat flux exposure and appropriate Bush Fire Attack Level (BAL).**

| HEAT FLUX EXPOSURE | DESCRIPTION | AS 3959 CONSTRUCTION LEVEL |
|---|---|---|
| **N/A** | Minimal attack from radiant heat and flame due to the distance of the building from the vegetation, although some attack by burning debris is possible. There is insufficient threat to warrant specific construction requirements. | BAL-LOW |
| **≤12.5** | Attack by burning debris is significant with radiant heat (not greater than 12.5kW/m²). Radiant heat is unlikely to threaten building elements (such as unscreened glass). Specific construction requirements for ember protection and accumulation of debris are warranted. | BAL-12.5 |
| **>12.5 ≤19** | Attack by burning debris is significant with radiant heat flux (not greater than 19kW/m²) threatening some building elements (such as screened glass). Specific construction requirements for embers and radiant heat are warranted. | BAL-19 |
| **>19 ≤29** | Attack by burning debris is significant and radiant heat flux (not greater than 29kW/m²) threatens building integrity. Specific construction requirements for ember and higher levels of radiant heat are warranted. Some flame contact is possible. | BAL-29 |
| **>29 ≤40** | Radiant heat flux and potential flame contact could threaten building integrity. | BAL-40 |
| **>40** | Significant radiant heat and significantly higher likelihood of flame contact from the fire front will threaten building integrity and result in significant risk to residents. | BAL-FZ |

Note: Attack from burning debris increases with the Bush Fire Attack Level. Source AS 3959.

## A1.8. SHIELDING

Where an elevation is shielded from direct radiant heat arising from bush fire attack, then the construction requirements for that elevation can be reduced to the next lower BAL.

Proposals to apply radiant heat shielding from another structure must be accompanied by a detailed performance-based solution addressing siting, view factor exposure and consideration of the potential fire spread from adjoining structures.

An elevation is considered to not be exposed to the source of bush fire attack if the line of sight between that elevation and the source of bush fire attack are obstructed by another part of the building.

The shielding of an elevation shall apply to all the elements of the wall but shall not apply to subfloors or roofs.

The construction requirements for a shielded elevation shall not be less than that required for BAL-12.5.

Reduced construction requirements do not apply where any elevation is BAL-FZ unless justified with an appropriate performance-based demonstration of the shielding.

**Figure 8. Radiant heat impact and shielding.**

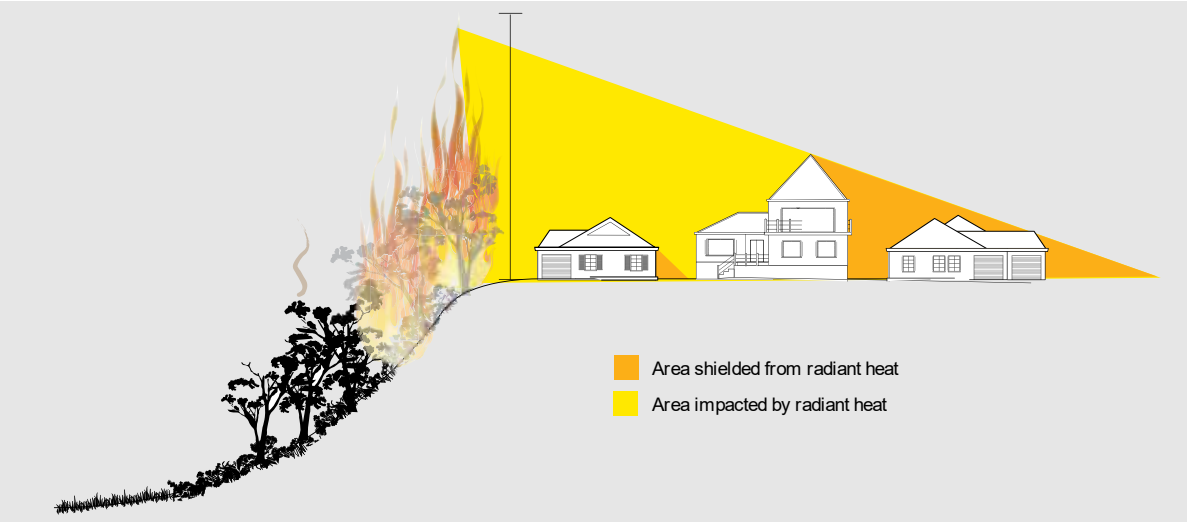
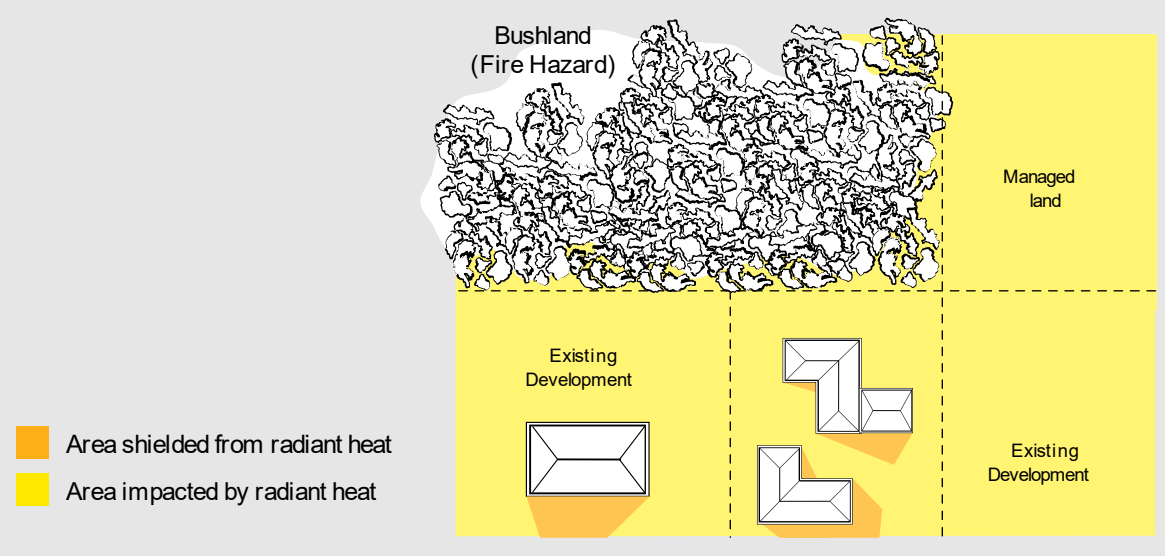



**Figure 9. Plan view of radiant heat impact and shielding.**




## A1.9. EXOTIC VEGETATION

In certain parts of the ACT there are communities of exotic vegetations that exist and could increase fire intensity if they cover large areas.

The four main exotic species that could contribute to increased fire intensity include:

> Camphor Laurel Cinnamomum camphora: (large tree).

> Privet Ligustrum sinense, Ligustrum lucidum: (large shrub).

- Lantana camara, Lantana montevidensis: (woody vine); and
- Running Bamboo Phyllostachys spp: (large grass).

These plant species have been declared environmental weeds as their control is significantly challenging. They generally occupy rich alluvial and volcanic soils. Under adverse fire weather conditions these plants can contribute to the intensity of bush fires.

Camphor Laurel trees have a significant amount of leaf fall, especially when stressed by drought or frost.

Anecdotal evidence obtained from previous fire events indicates that although these trees generally do not carry a canopy fire, they commonly support intense surface fires.

Exotic species display similar fire behaviour characteristics to some of the native vegetation classifications with lower fuel loads. Table 18 can be used to convert the vegetation formations and fuel loads where the predominant vegetation formation is demonstrated over 140 metres to be an exotic species. Where a mixture of exotic and native vegetation exists, the vegetation fuel loads having the most influence on fire behaviour will apply.

For other exotic vegetation types not identified in Table 18, an assessment should be undertaken to determine the most appropriate fuel loads to apply. This should consider the structure and fuel loads and may require consultation with the ACT ESA.

**Table 18 Exotic vegetation conversions**

| PREDOMINANT VEGETATION TYPE | < or equal to 70% canopy cover | >70% canopy cover |
|---|---|---|
| | **Vegetation formation in AS 3959** | |
| Exotic vegetation (Camphor Laurel, Privet) or woody weeds (such as Lantana) mix | Woodland | Rainforest |
| Rainforest or woody weeds (such as Lantana) mix | Woodland | Rainforest |
| Bamboo mixed with exotic vegetation | Tall heath | Woodland |
| Bamboo mixed with rainforest vegetation | Woodland | Rainforest |

## A1.10. LOW THREAT VEGETATION – EXCLUSIONS

Modified landscapes and riparian areas vary significantly in structure and composition but are generally considered as bush fire hazards. The following exclusions of AS 3959 apply, and are not required to be considered for the purposes of BMS, as detailed below:

- Single areas of vegetation less than 1 hectare in area and greater than 100 metres separation from other areas of forest or woodland vegetation.
- Multiple areas of vegetation less than 0.25 hectares in area and not within 20m of the site, or each other or of other areas of vegetation being classified vegetation.
- Strips of vegetation less than 20 metres in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m of the site or to each other, or other areas of hazardous vegetation.
- Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load, including grassland managed in a minimal fuel condition, wetlands (with little grassland vegetation and no

forest vegetation), maintained lawns, golf courses such as playing areas and fairways, maintained public reserves and parklands, sporting fields, vineyards, orchards, market gardens and other non-curing crops, cultivated gardens, arboretums, commercial nurseries, nature strips and windbreaks.

Note: 1. Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bush fire attack (recognizable as short, cropped grass for example, to a nominal height of 200 mm). 2. A windbreak is considered a single row of planted trees located on a boundary and used as a screen or to reduce the effect of wind on the leeward side of the trees.

- Existing areas of managed gardens and lawns within curtilage of buildings.
- Non-vegetated areas, including waterways, roads, footpaths, buildings, and rocky outcrops.

## A1.11. ASSESSING REMNANT BUSHLAND AND NARROW VEGETATION CORRIDORS

The size and shape of small areas of vegetation influences the behaviour of bush fires and the associated risk to the built environment. Small or narrow parcels of vegetation have less opportunity to support fully developed bush fires because of their limited size.

There are two recognized pathways for assessing remnant bushland or narrow vegetated corridors. An assessment can either follow the simplified approach or the short fire run approach. The two approaches should not normally be used simultaneously to assess a patch of vegetation.

### A1.11.1. Simplified approach

The simplified approach provides an acceptable method for assessing remnant vegetation. Remnant vegetation is a parcel of vegetation with a size of less than 1 Ha or a shape that provides a potential fire run that could threaten buildings not exceeding 50m.

These remnants are considered a low hazard and APZ setbacks and building construction standards for these may be the same as for rainforests.

The effective slope is to be determined under the remnant that provides the most significant bush fire behaviour.

### A1.11.2. Short fire run

Small or narrow parcels of vegetation that are less likely to support fully developed bush fires are referred to as a short fire run (SFR).

Before any SFR proposal is developed, the ACT ESA should be consulted for their agreement that the SFR approach is appropriate for the parcels being considered.

Assessment of SFRs is undertaken by determining the reduced head fire width and flame length of the SFR, as appropriate, then calculating the amount of radiant heat impacting the site. From this modelling, APZs may be calculated which are less than those required for larger bushland parcels.

The SFR method is based on AS 3959 Method 2.

Proposals for the SFR methodology need to be prepared as a performance-based solution and should go through the BFDB process.

## A1.12. COMPREHENSIVE APZ, BAL AND VEGETATION CLASS TABLES

The following pages contain detailed tables for determining BALs, minimum distances for APZs, and vegetation fuel loads, as listed below.

## TABLE INDEX


**Sensitive use development**

| | | |
|---|---|---|
| Table 19 | Minimum distances for APZs - Sensitive use development | <10kW/m2 @ 1200K |

**Residential subdivision**

| | | |
|---|---|---|
| Table 20 | Minimum distances for APZs - residential development FFDI 100 | <29kW/m² @ 1090K areas |

**Residential development**

| | | |
|---|---|---|
| Table 21 | Determination of BALs - FFDI 100 - residential developments | |

**Table 19 Minimum distances for APZs – Sensitive use development (<10kW/m2, 1200K)**

| KEITH VEGETATION FORMATION | EFFECTIVE SLOPE | | | | |
|---|---|---|---|---|---|
| | Up slopes and flat | >0°-5° | >5°-10° | >10°-15° | >15°-20° |
| | Distance (m) from the asset to the predominant vegetation formation | | | | |
| Rainforest | 38 | 47 | 57 | 69 | 81 |
| Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland | 67 | 79 | 93 | 100 | 100 |
| Grassy and Semi-Arid Woodland (including Mallee) | 42 | 50 | 60 | 72 | 85 |
| Forested Wetland (excluding Coastal Swamp Forest) | 34 | 42 | 51 | 62 | 73 |
| Freshwater Wetlands | 19 | 22 | 25 | 28 | 30 |
| Grassland | 36 | 40 | 45 | 50 | 55 |

**Table 20 Minimum distances for APZs – residential development, FFDI 100 areas (<29kW/m2, 1090K)**

| KEITH VEGETATION FORMATION | EFFECTIVE SLOPE | | | | |
|---|---|---|---|---|---|
| | Up slopes and flat | >0°-5° | >5°-10° | >10°-15° | >15°-20° |
| | Distance (m) from the asset to the predominant vegetation formation | | | | |
| Rainforest | 11 | 14 | 18 | 23 | 30 |
| Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland | 24 | 29 | 36 | 45 | 56 |
| Grassy and Semi-Arid Woodland (including Mallee) | 12 | 16 | 20 | 25 | 32 |
| Forested Wetland (excluding Coastal Swamp Forest) | 10 | 12 | 16 | 20 | 26 |
| Freshwater Wetlands | 5 | 6 | 6 | 7 | 8 |
| Grassland | 10 | 12 | 13 | 15 | 17 |

**Table 21 Determination of BAL, FFDI 100 – residential developments**

| KEITH VEGETATION FORMATION | EFFECTIVE SLOPE | | | | |
|---|---|---|---|---|---|
| | BAL-FZ | BAL-40 | BAL-29 | BAL-19 | BAL-12.5 |
| | Distance (m) asset to predominant vegetation class | | | | |
| **ALL UPSLOPE AND FLATLAND** | | | | | |
| Rainforest | < 8 | 8 -< 11 | 11 -< 16 | 16 -< 23 | 23 -< 100 |
| Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland | < 18 | 18 -< 24 | 24 -< 33 | 33 -< 45 | 45 -< 100 |
| Grassy and Semi-Arid Woodland (including Mallee) | < 9 | 9 -< 12 | 12 -< 18 | 18 -< 26 | 26 -< 100 |
| Forested Wetland (excluding Coastal Swamp Forest) | < 7 | 7 -< 10 | 10 -< 14 | 14 -< 21 | 21 -< 100 |
| Freshwater Wetlands | < 4 | 4 -< 5 | 5 -< 7 | 7 -< 11 | 11 -< 100 |
| Grassland | < 8 | 8 -< 10 | 10 -< 15 | 15 -< 22 | 22 -< 50 |
| **> 0 > 5 DEGREES – DOWNSLOPE** | | | | | |
| Rainforest | < 11 | 11 -< 14 | 14 -< 21 | 21 -< 29 | 29 -< 100 |
| Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland | < 22 | 22 -< 29 | 29 -< 40 | 40 -< 54 | 54 -< 100 |
| Grassy and Semi-Arid Woodland (including Mallee) | < 12 | 12 -< 16 | 16 -< 23 | 23 -< 32 | 32 -< 100 |
| Forested Wetland (excluding Coastal Swamp Forest) | < 9 | 9 -< 12 | 12 -< 18 | 18 -< 26 | 26 -< 100 |
| Freshwater Wetlands | < 4 | 4 -< 6 | 6 -< 8 | 8 -< 12 | 12 -< 100 |
| Grassland | < 9 | 9 -< 12 | 12 -< 17 | 17 -< 25 | 25 -< 50 |
| **> 5 > 10 DEGREES – DOWNSLOPE** | | | | | |
| Rainforest | < 14 | 14 -< 18 | 18 -< 26 | 26 -< 37 | 37 -< 100 |
| Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland | < 28 | 28 -< 36 | 36 -< 49 | 49 -< 65 | 65 -< 100 |
| Grassy and Semi-Arid Woodland (including Mallee) | < 15 | 15 -< 20 | 20 -< 28 | 28 -< 39 | 39 -< 100 |
| Forested Wetland (excluding Coastal Swamp Forest) | < 12 | 12 -< 16 | 16 -< 23 | 23 -< 33 | 33 -< 100 |
| Freshwater Wetlands | <5 | 5 -< 6 | 6 -< 10 | 10 -< 14 | 14 -< 100 |
| Grassland | < 10 | 10 -< 13 | 13 -< 20 | 20 -< 28 | 28 -< 50 |
| **> 10 > 15 DEGREES – DOWNSLOPE** | | | | | |
| Rainforest | < 17 | 17 -< 23 | 23 -< 34 | 34 -< 46 | 46 -< 100 |
| Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland | < 36 | 36 -< 45 | 45 -< 60 | 60 -< 77 | 77 -< 100 |
| Grassy and Semi-Arid Woodland (including Mallee) | < 19 | 19 -< 25 | 25 -< 36 | 36 -< 49 | 49 -< 100 |
| Forested Wetland (excluding Coastal Swamp Forest) | < 15 | 15 -< 20 | 20 -< 29 | 29 -< 41 | 41 -< 100 |
| Freshwater Wetlands | < 5 | 5 -< 7 | 7 -< 11 | 11 -< 16 | 16 -< 100 |
| Grassland | < 11 | 11 -< 15 | 15 -< 23 | 23 -< 32 | 32 -< 50 |
| **> 15 > 20 DEGREES – DOWNSLOPE** | | | | | |
| Rainforest | < 23 | 23 -< 30 | 30 -< 42 | 42 -< 56 | 56 -< 100 |
| Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland | < 46 | 46 -< 56 | 56 -< 73 | 73 -< 92 | 92 -< 100 |
| Grassy and Semi-Arid Woodland (including Mallee) | < 24 | 24 -< 32 | 32 -< 44 | 44 -< 59 | 59 -< 100 |
| Forested Wetland (excluding Coastal Swamp Forest) | < 19 | 19 -< 26 | 26 -< 37 | 37 -< 50 | 50 -< 100 |
| Freshwater Wetlands | < 6 | 6 -< 8 | 8 -< 13 | 13 -< 18 | 18 -< 100 |
| Grassland | <13 | 13 -< 17 | 17 -< 26 | 26 -< 36 | 36 -< 50 |

# APPENDIX 2. SUBMISSION REQUIREMENTS, PERFORMANCE-BASED SOLUTIONS AND BUSH FIRE DESIGN BRIEFS

This appendix details the information requirements for the range of Development Applications (DAs) on BPA and the submission requirements where a performance-based solution is proposed.

## A2.1. SUBMISSION REQUIREMENTS FOR A BUSH FIRE ASSESSMENT REPORT

The detailed information to be contained within a Bush Fire Assessment Report submitted to the ACT ESA is:

1. a description (including the address) of the property on which the development the subject of the application is proposed to be carried out.
2. a classification of the vegetation on and surrounding the property (out to 140 metres from the boundaries of the property) in accordance with the system for classification of vegetation contained in Appendix 1.
3. an assessment of the slope of the land on and surrounding the property (out to 100 metres from the boundaries of the property).
4. identification of any significant environmental features on the property.
5. the details of any threatened species, population or ecological community identified under the *Nature Conservation Act 2014* (ACT) that is known to the applicant to exist on the property.
6. the details and location of any Aboriginal object (within the meaning of the *Heritage Act 2004* (ACT) or Aboriginal place (within the meaning of that Act) that is known to the applicant to be situated on the property:
7. a bush fire assessment for the proposed development (including the methodology used in the assessment) that addresses the following matters:
    a. the extent to which the development is to provide for setbacks, including Asset Protection Zones.
    b. the siting and adequacy of water supplies for firefighting.
    c. the capacity of public roads in the vicinity to handle increased volumes of traffic in the event of a bush fire emergency.
    d. whether or not public roads in the vicinity that link with the fire trail network have two-way access.
    e. the adequacy of arrangements for access to and egress from the development site for the purposes of an emergency response.
    f. the adequacy of bush fire maintenance plans and fire emergency procedures for the development site.
    g. the construction standards to be used for building elements in the development.
    h. the adequacy of sprinkler systems and other fire protection measures to be incorporated into the development.
    i. an assessment of the extent to which the proposed development conforms with or deviates from the standards, specific objectives, performance criteria and acceptable solutions set out in Sections 5-8 of BMS.

### A2.1.1. Subdivisions

The submission requirements given above for a Bush Fire Assessment Report are applicable to subdivision on BPA. Additional considerations for subdivision are outlined below.

To allow for flexibility at the building design stage of development, building envelopes are not always identified at the subdivision stage. A conceptual plan drawn to scale identifying building envelopes may be requested to demonstrate that individual lots can provide a suitable APZ and compliant BALs. Unless otherwise specified, a building envelope of 15m by 15m will be assumed.

Where staged development is proposed, the bush fire assessment report must explain how the provisions of this document will be satisfied for each stage of the development. This is particularly important to ensure that appropriate APZs will be provided at all stages of development. Special attention must also be given to the provision of emergency access and egress and the provision of water supplies.

In relation to significant environmental features, threatened species, endangered populations, endangered ecological communities and Aboriginal heritage issues, sufficient information is required to ascertain that environmental issues are not a constraint to development. Approval for the loss or removal of environmental assets is the role of the consent authority.

## A2.2. SUBMISSION REQUIREMENTS FOR RESIDENTIAL INFILL DEVELOPMENT

Residential infill development proposals on BPA must be accompanied by bush fire assessments and reports demonstrating compliance with BMS.

In particular, the following must be addressed:

- a statement that the site is BPA.
- the location, extent, and vegetation formation of any bushland on or within 140 metres of the site.
- the slope and aspect of the site and of any BPA within 100 metres of the site.
- any features on or adjoining the site that may mitigate the impact of a bush fire on the proposed development.
- a statement assessing the likely environmental impact of any proposed BPMs.
- a site plan showing access, water supplies, APZs, BAL requirements and building footprint in relation to the bush fire hazards; and
- calculated BAL construction levels.

For more complex applications or performance-based solutions, a recognised consultant should be engaged to prepare a bush fire assessment report and a Bush Fire Management Plan. (See A2.5).

## A2.3. SUBMISSION REQUIREMENTS AND ASSESSMENT METHODS FOR PERFORMANCE-BASED SOLUTIONS

To achieve compliance with BMS, proposals must comply with either the acceptable solutions or a performance criterion.

For performance-based applications, it must be demonstrated how the product, design or material can meet the performance criteria of this document including the intent of measures and, the aim and objectives. All performance-based solutions should be accompanied by a Bush Fire Management Plan (see A2.5).

A performance-based solution will only comply with BMS when the assessment methods used satisfactorily demonstrate compliance with the performance criteria.

Performance-based solutions must be assessed using one or more of the assessment methods. In some cases, the development of a performance-based solution will include the BFDB process.

### A2.3.1. Assessment methods

Assessment methods are how a proponent demonstrates that a solution achieves the performance criteria.

The assessment methods described below are applicable to the assessment of performance-based solutions to determine that they comply with the relevant performance criteria, as appropriate.

- Evidence to support that the use of a material, form of construction or design meets the performance criteria as described in BMS.
- Verification methods such as a test, inspection, calculation, or other method that determines whether a performance-based solution complies with the relevant performance criteria; and
- Comparison with the acceptable solutions.

All Verification Methods must be acceptable to the appropriate authority. NCC 2022 contains new Verification Methods that can be used to demonstrate compliance with the relevant NCC Performance Requirements for buildings in bush fire prone areas.

## A2.4. BUSH FIRE DESIGN BRIEF (BFDB)

A BFDB is the first step in a performance-based solution and forms the basis of the ensuing analysis.

It is the process that defines the scope of work for the bush fire analysis and report. One of the main reasons for the BFDB is to translate performance criteria into objective parameters and criteria that can then be evaluated in the bush fire analysis.

The BFDB requires involvement of all relevant stakeholders and their agreement on the ground rules for the ensuing bush fire analysis. It is important to note that the BFDB usually precedes the detailed analysis and report but may occur after the analysis has been completed, if all relevant stakeholders agree on the parameters and criteria used. However, to minimise design risk, the BFDB should be undertaken before detailed analysis and documentation occurs.

The BFDB is an important part of the performance-based design process, as it allows the objectives, proposed design, analysis methods, assumptions, and acceptance criteria to be agreed on to validate the bush fire analysis. The compliance approach needs to be agreed on as part of the BFDB. The approach may be based on equivalency to the acceptable solutions, direct compliance with the performance criteria, or a combination.

The complexity of the BFDB will vary depending on the complexity of the bush fire issues being considered.

The process by which the BFDB is undertaken shall be documented as part of the bush fire analysis report.

The BFDB is not in itself an agreement as to the acceptability of the proposed solution. Rather, it focuses on the methods of analysis which will be used in evaluating whether the proposed design is adequate and appropriate.

The process undertaken for a BFDB should follow that for a Fire Engineering Brief described in the International Fire Engineering Guidelines (2005)

## A2.5. BUSH FIRE MANAGEMENT PLAN

Preparation of a Bush Fire Management Plan (BFMP) is required for estate development plans and renewable energy facilities in bush fire prone areas.

A BFMP should detail all bush fire safety aspects of the proposed development including:

- APZ locations and management details.
- Landscaping requirements including indicative design layout and vegetation density thresholds.

- Access provisions such as locations, passing bays and alternate emergency access.
- Water supplies and bush fire suppression systems (including drenching systems, static water supply, natural water sources etc.).
- Schedule of the BAL requirements and building footprints as well as any specific construction details (i.e., bush fire shutter operating instructions).
- Details regarding the Bush Fire Emergency Management and Evacuation Plan; and
- Any other essential bush fire safety requirements.

## A2.6. QUALIFIED CONSULTANTS

It is recommended that developers and development applicants utilise a suitably qualified consultant in bush fire risk assessment.

Given the complexity of performance-based solutions, it is recommended that they are undertaken and fully justified by qualified consultants.

For a consultant to be recognised, they must demonstrate several requirements as part of a recognised accreditation scheme. For example, consultants could be a Bushfire Planning and Design (BPAD) Accredited Practitioner.

## A2.7. PRE-DA ADVICE

The ESA provides a pre-DA advice service as a means for proponents of development to seek information and obtain clarity about the ESA position on a proposal before a formal DA is lodged with the consent authority.

The pre-DA advice service is intended for more complex proposals which raise issues in relation to compliance with this document. This may involve instances where a performance-based solution is proposed.

For further information on the pre-DA advice, enquiries can be made to EmergencyManagement@act.gov.au

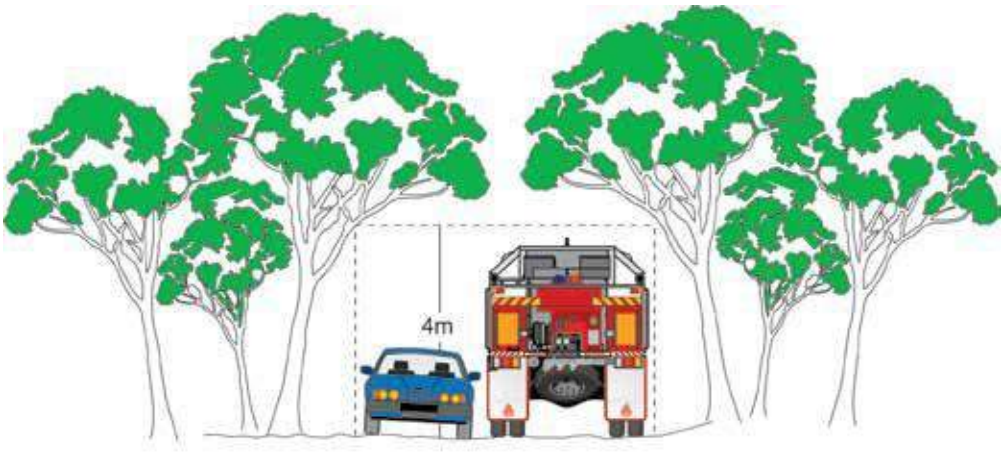
# APPENDIX 3. ACCESS

This appendix provides design principles for emergency service vehicle access.

## A3.1. VERTICAL CLEARANCE

An unobstructed clearance height of at least 4 metres should be maintained above all access ways including clearance from building construction, archways, gateways, and overhanging structures (e.g., ducts, pipes, sprinklers, walkways, signs, and beams). This also applies to vegetation overhanging roads.

**Figure 10. Vertical clearance**



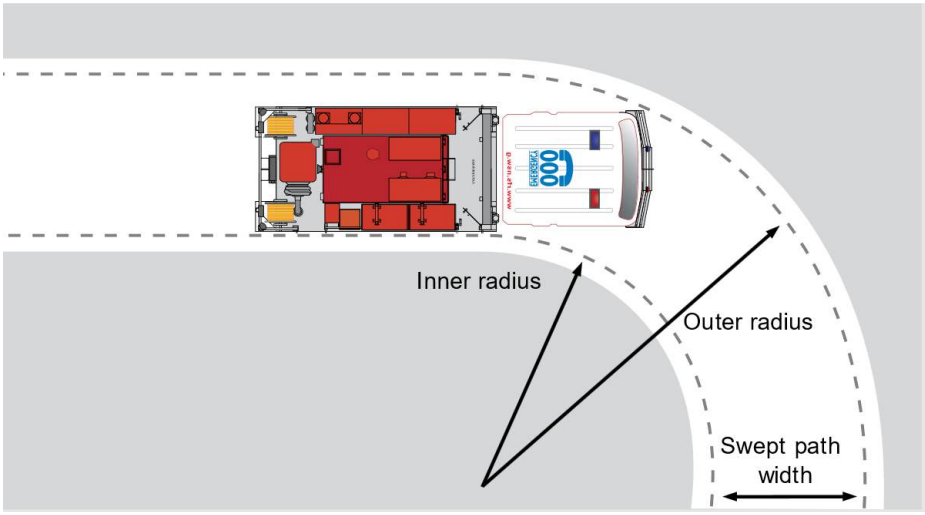

## A3.2. VEHICLE TURNING REQUIREMENTS

Curved carriageways should be constructed using the minimum swept path as outlined in Table 22.

**Table 22 Minimum curve radius for turning vehicles.**

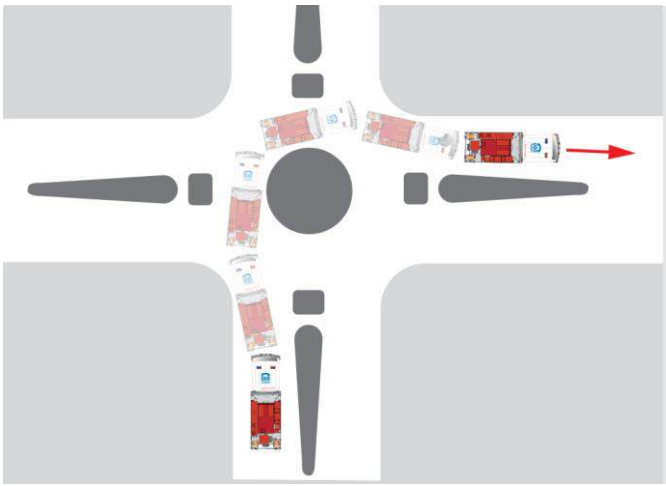
| CURVE RADIUS (INSIDE EDGE IN METRES) | SWEPT PATH (METRES WIDTH) |
|---|---|
| < 40 | 4.0 |
| 40 - 69 | 3.0 |
| 70 - 100 | 2.7 |
| > 100 | 2.5 |

**Figure 11. Swept path width for turning vehicles.**




The radius dimensions given are for wall to wall clearance where body overhangs travel a wider arc than the wheel tracks (vehicle swept path). The swept path shall include an additional 500mm clearance either side of the vehicle.

**Figure 12. Roundabout swept path.**



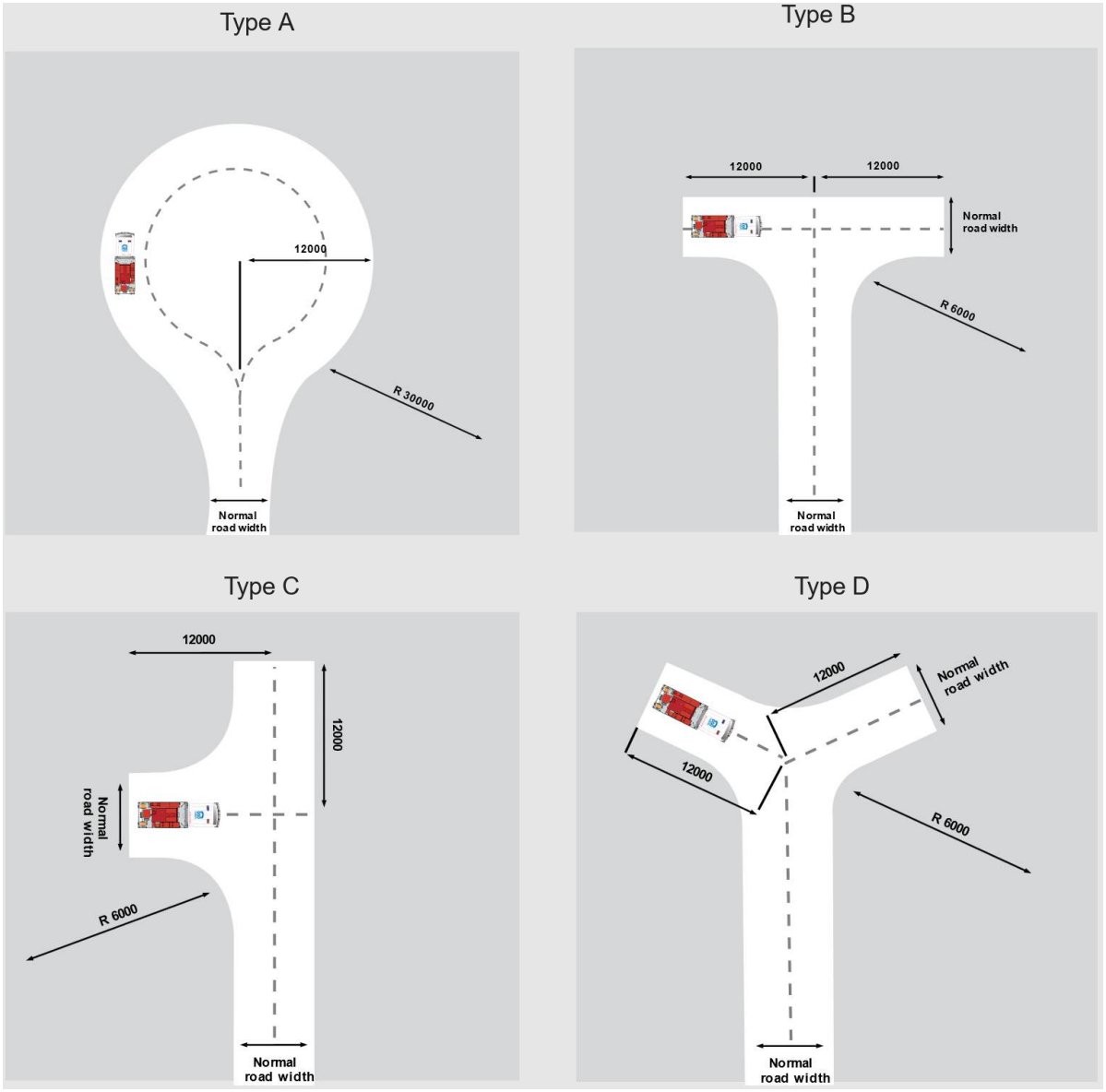
Example of a swept path as applied to a roundabout. The distance between inner and outer turning arcs allows for expected vehicle body swing of front and rear overhanging sections (the swept path).

## A3.3. VEHICLE TURNING HEAD REQUIREMENTS

Dead ends that are longer then 200m must be provided with a turning head area that avoids multipoint turns. “No parking” signs are to be erected within the turning head.

The minimum turning radius shall be in accordance with Table 22. Where multipoint turning is proposed the ACT ESA will consider the following options:

**Figure 13. Multipoint turning options.**



## A3.4. PASSING BAYS

The construction of passing bays, where required, shall be 20m in length and provide a minimum trafficable width at the passing point of 6m.

**Figure 14. Passing bays can provide advantages when designed correctly. Poor design can and does severely impede access.**

## A3.5. PARKING

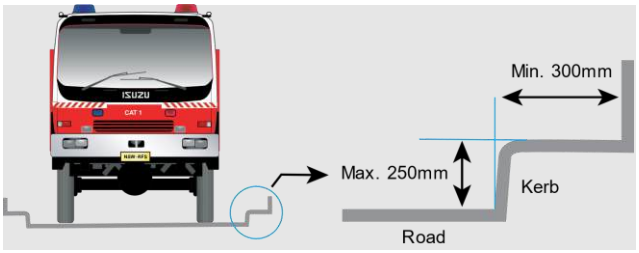
Parking can create a pinch point in required access. The location of parking should be carefully considered to ensure fire appliance access is unimpeded. Hydrants shall be located outside of access ways and any parking areas to ensure that access is always available.

**Figure 15. Hydrants and parking bays.**

## A3.6. KERB DIMENSIONS

All kerbs constructed around access roads should be no higher than 250mm and free of vertical obstructions at least 300mm back from the kerb face to allow clearance for front and rear body overhang.

**Figure 16. Carriageway kerb clearance dimensions.**




## A3.7. SERVICES

Hydrant services should be located outside the carriageway and parking bays to permit traffic flow and access. Setup of standpipes within the carriageway may stop traffic flow. Hydrant services shall be located on the side of the road away from the bush fire threat where possible.

## A3.8. LOCAL AREA TRAFFIC MANAGEMENT (LATM)

The objective of LATM is to regulate traffic an acceptable level of speed and traffic volume within a local area.

Traffic engineers and planners should consider LATM devices when planning for local traffic control and their likely impact on emergency services. LATM devices by their nature are designed to restrict and impede the movement of traffic, especially large vehicles.

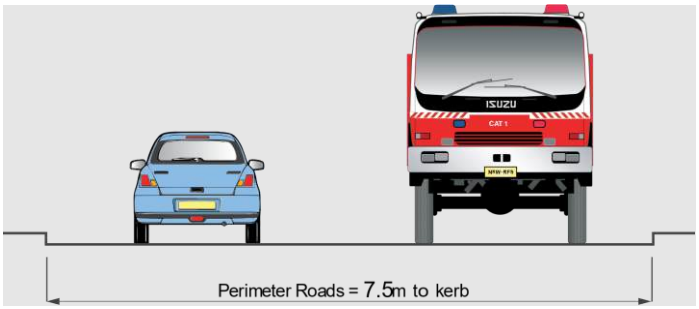
Where LATM devices are provided they are to be designed so that they do not impede fire vehicle access.

## A3.9. ROAD TYPES

### A3.9.1. Perimeter Roads

Perimeter roads are to be provided with a minimum clear width of 7.5m. Parking and hydrants are to be provided outside of carriageways. Hydrants are to be located outside of carriageways and parking areas.

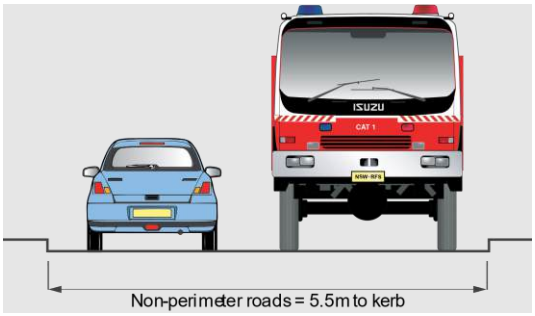
**Figure 17. Perimeter road widths.**




### A3.9.2. Non-perimeter Roads

Non-perimeter roads shall be provided with a minimum clear width of 5.5m. Parking is to be provided outside of the carriageway and hydrants are not to be in carriageways or parking areas.

**Figure 18. Non-perimeter road widths.**




## A3.9.3. Property access

Property access roads are to be a minimum of 4m wide.

**Figure 19. Property access roads are to be a minimum of 4m wide.**

## A3.9.4. Standards – fire trails

The classification of fire roads, tracks, and trails (Table 23) is performance based to provide clear guidance to land managers and response agencies during incidents.

Table 24 identifies the requirements for providing passing opportunities on fire trails, and requirements for providing vehicle turnaround capability on dead-end trails.

In grassland areas or in rural areas or reserves, the mineral earth ground fire access network may be supplemented by slashed grass breaks or ad hoc access trails through properties or reserves. These breaks provide additional vehicle access during suppression operations, but do not provide as safe suppression areas as mineral earth roads. These slashed trails are generally not mapped, and the locations may change over time.

**Table 23 Fire trail access standards**

| CLASSIFICATION | PERFORMANCE STANDARD | NOMINAL WIDTH AND MAXIMUM GRADE | SURFACE | NOMINAL VEGETATION MAINTENANCE |
|---|---|---|---|---|
| Walking track | To allow the safe passage of firefighters on foot | Generally, these features will be less than 1 m in width | Natural surface, grass, sealed or gravel surface | Vegetation maintained to allow single-file walking |
| Light unit | To allow the safe passage of light units (e.g., 4 × 4 Landcruiser or similar, carrying a water tank of 400–600 liters) | Generally, these features will have a width of 3 m, with a maximum grade of 20 degrees | Natural surface, grass, sealed or gravel surface | Vegetation maintained up to 2 m either side of the road edge. Up to 4 m of vegetation may be removed where any sharp corners, switch backs and intersections occur. Vegetation to be removed to a height of 3 m. |
| Tanker | To allow the safe passage of tankers and rigid floats (e.g., 4 × 4 trucks, 8–12 tons, carrying a water tank of 2500– 5000 liters) | Generally, these features will have a width of 4 m, with a maximum grade of 15 degrees | Natural surface, grass, sealed or gravel surface | Vegetation maintained up to 2 m either side of the road edge. Up to 4 m of vegetation may be removed where any sharp corners, switch backs and intersections occur. Vegetation to be removed to a height of 4 m. |
| Articulated float | To allow the safe passage of articulated floats (truck and trailer carrying a D6-sized dozer) | Generally, these features will have a width of 5 m and a maximum grade of 12 degrees | Sealed or gravel surface | Vegetation maintained up to 2 m either side of the road edge. Up to 4 m of vegetation may be removed where any sharp corners, switch backs and intersections occur. Vegetation to be removed to a height of 5 m. |

CAFS = compressed air foam system

**Table 24 Nominal requirements for passing and dead-end fire trails**

| | |
|---|---|
| Passing opportunities | Use road verges and natural areas wherever possible to allow two vehicles to safely pass.<br><br>In the case of light unit trails, to allow two light units to pass, and in the case of tanker trails, to allow two tankers to pass.<br><br>If there are no opportunities for vehicles to pass in a 250 m section, where terrain and ecological constraints allow, provide for widening of pavement, verges, or the construction of passing bays. Where dormant trails are reopened during suppression operations, suitable passing areas should be constructed where terrain and ecological constraints allow to ensure vehicles can pass within a 250 m section. |
| Dead ends | Avoid as far as possible and signpost where they occur.<br><br>Where dead ends exist, a turnaround of sufficient radius for the standard of the trail must be provided (e.g., in the case of light unit trails, the turnaround must allow a light unit to turn around on full lock).<br><br>If there is insufficient space for such a turnaround due to the topography or other constraints, provision should be made to allow a maximum three-point turn, or a 'T' or 'Y' shaped turnaround area. The dimensions of the 'T' or 'Y' shaped turn around must be appropriate for the type of vehicles that will use the trail.<br><br>Turnarounds should be constructed when dormant trails are reconstructed for suppression operations, and temporary signage provided at the start of these trails. |

## A3.10. ROAD SIGN STANDARDS

Sufficient roads and tracks will be signposted to allow navigation through the fire trail network (note that this may not require all roads and trails to be signposted). A systematic program of phasing in new signs on identified fire access will be implemented, consistent with resource availability.

## A3.11. AERIAL ACCESS

### A3.11.1. Aerial access classification

Helipads are natural or constructed features on which helicopters may safely land. Helipads provide access for firefighters to suppress remote area fires, and locations from which helicopters may operate during bushfire suppression and prescribed burning operations. Helipads are broadly classified according to the size of the helicopter that may safely land on them, although the decision to use a helipad is ultimately rests with the pilot in charge of the aircraft. Indicative helipad standards are at Table 25.

Within the ACT, there are several strategically advantageous helipads that have been identified and constructed to provide rapid access to remote areas in circumstances where there is no other viable method of access. These permanent helipads (including suitable natural features) have been identified and classified as per Table 25. Additional temporary helipads may be constructed to facilitate enhanced access to a remote area during a bushfire operation.

**Table 25 Helipad standards**

| CLASSIFICATION | NOMINAL DESCRIPTION |
|---|---|
| Light | To allow the safe landing of light helicopters (e.g., Jet Rangers, AS350BAs, BK117). These helipads will usually consist of the following three zones:<br>1. Zone A – a rock/grassed/mineral earth area 7 x 7 m with no protrusions such as tree stumps or rocks above 20 cm in height.<br>2. Zone B – an area cleared of trees and tall shrubs for an additional 13 m with no large protrusions such as tree stumps or large rocks above a height of 0.4 m.<br>3. Zone C – all tall trees outside of Zone B removed which may obstruct an approach angle of 40 degrees to Zone A, in one or more directions. |
| Medium | To allow the safe landing of medium-sized helicopters (e.g., Bell 412). These helipads will usually consist of the following three zones:<br>1. Zone A – a rock/grassed/mineral earth area 15 x 15 m with no protrusions such as tree stumps or rocks above 20 cm in height.<br>2. Zone B – an area cleared of trees and tall shrubs for an additional 20 m with no large protrusions such as tree stumps or large rocks above a height of 0.4 m.<br>3. Zone C – All tall trees outside of Zone B removed which may obstruct an approach angle of 40 degrees to Zone A, in one or more directions. |

Where no other access method is viable, or when deemed operationally necessary, remote area firefighters may access an area by being winched in by helicopter; however, this type of operation is considerably riskier than using a helipad and is avoided where possible. After being inserted via a winching operation, remote area firefighters will normally construct a temporary helipad close to the bushfire to allow helicopters to safely land, removing the need to undertake further winching operations.

### A3.11.2. Aerial access construction and maintenance

Permanent helipads must be constructed and maintained to a suitable standard to ensure a safe working environment and ameliorate social, economic, and environmental impacts. Existing natural clearings should be used wherever practicable.

New permanent helipads will only be constructed where they provide a clear strategic benefit, and the financial and environmental costs of construction and maintenance do not outweigh the benefits for fire management. In certain circumstances, temporary helipads constructed as part of a bushfire suppression activity may be maintained as new permanent helipads where they also meet these criteria.

The use of helipads during fire suppression operations must consider the impacts on hydrological and environmental values. The transport and storage of fuel and fire retardants on or adjacent to helipads in remote locations must ensure that measures are taken to avoid spillage or contamination of the site. In some cases, this will not be permitted.

Existing maintained helipads will be mapped and classified by EPSDD and provided to the ESA.

# APPENDIX 4. ASSET PROTECTION ZONE REQUIREMENTS

In combination with other BPMs, a bush fire hazard can be reduced by implementing simple steps to reduce vegetation levels. This can be done by designing and managing landscaping to implement an APZ around the property.

Careful attention should be paid to species selection, their location relative to their flammability, minimising continuity of vegetation (horizontally and vertically), and ongoing maintenance to remove flammable fuels (leaf litter, twigs, and debris).

This Appendix sets the standards which need to be met within an APZ.

## A4.1. ASSET PROTECTION ZONES

An APZ is a fuel-reduced area surrounding a building or other asset. It is located between the building or other asset and the bush fire hazard.

An APZ provides:

- a buffer zone between a bush fire hazard and an asset.
- an area of reduced bush fire fuel that allows for suppression of fire.
- an area from which backburning or hazard reduction can be conducted; and
- an area which allows emergency services access and provides a relatively safe area for firefighters and homeowners to defend their property.

Bush fire fuels should be minimised within an APZ. This is so that the vegetation within the zone does not provide a path for the spread of fire to the building, either from the ground level or through the tree canopy.

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- direct flame contact on the building.
- damage to the building asset from intense radiant heat; and
- ember attack.

The methodology for calculating the required APZ distance is contained within Appendix 1. The width of the APZ required will depend upon the development type and bush fire threat. APZs for new development are set out within Sections 5, 6 and 7 of this document.

### A4.1.1. Inner Asset Protection Zones (IAPZs)

When establishing or maintaining an IAPZ established post 2022, the following requirements apply:

#### Trees

- tree canopy cover should be less than 15% at maturity.
- trees at maturity should not touch or overhang the building.
- lower limbs should be removed up to a height of 3m above the ground.
- tree canopies should be separated by 3 to 5m; and
- preference should be given to smooth barked and evergreen trees.

### Shrubs

- create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided.
- shrubs should not be located under trees.
- shrubs should not form more than 10% ground cover: and
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

### Grass

Grassland maintained at ≤200 mm height when grassland curing ≥70%

- grass should be kept mown; and
- leaves and vegetation debris should be removed.

An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bush fires. Maintenance of the IAPZ as described above should be undertaken regularly, particularly in advance of the bush fire season.

Any significant variation on the default standards shall be approved by the ESA Commissioner.

# APPENDIX 5. FUEL MANAGEMENT STANDARDS

> Existing APZs as mapped by the ESA outside of developed land shall comply with the below standards. (Existing APZ's have been determined by applying the process described in the 2014 ACT Bushfire Management Standards or identified during development of the site.)

> New APZs proposed for greenfield development shall comply with A4.1.1 Inner Asset Protection Zones in Appendix 4 of part one.

> Brownfield development requirements.

**Table 26 Fuel management standards – Asset Protection Zones**

| APZ TYPE | VEGETATION TYPE | FUEL MANAGEMENT STANDARDS |
|---|---|---|
| INNER | | |
| Default standards to be applied across at least 80% of the zones as mapped. The standards will be applied to 100% of the zones mapped in all new developments. Where default standards cannot be achieved, the responsible land manager may identify alternative treatments to meet the overall objectives for the zone. Any significant variation on the default standards shall be approved by the ESA. | Forest and woodland | Maintained at an overall fuel hazard ≤low. 3–5 m canopy separation or fuel gap to crown, > 3 m maintained and grass maintained at ≤200mm height when grass curing ≥ 70%. |
| | Grass and open woodland | Grassland maintained at ≤200 mm height when grassland curing ≥70%. |
| OUTER | | |
| Default standards to be applied across at least 70% of the zones as mapped. Where default standards cannot be achieved, the responsible land manager may identify alternative treatments to meet the overall objectives for the zone. Any significant variation on the default standards shall be approved by the ESA. | Forest and woodland | Overall fuel hazard ≤moderate |
| | Grass and open woodland | Grassland fire hazard ≤35 when grassland curing ≥70% & Overall fuel hazard ≤moderate |

ESA = ACT Emergency Services Agency
The grassland fire hazard is a score deriving from the height of grass (m) and the amount of cover (%). See Table 29.

**Table 27 Fuel management standards – Strategic Firefighting Advantage Zones (SFAZs)**

| SFAZ TYPE | VEGETATION OR BREAK TYPE | FUEL MANAGEMENT STANDARDS |
|---|---|---|
| BROAD AREA TREATMENT | | |
| Application of broad-area hazard reduction burning that aims to reduce fuel across multiple landscape elements (ridges, side slopes, gullies) and treat at least 70% of the area identified where possible. Where default standards cannot be achieved, the responsible land manager may identify alternative treatments to meet the overall objectives for the zone. Any significant variation on the default standards shall be approved by the ESA. | Forest and shrubland | Overall fuel hazard ≤ high |
| | Grass and open woodland | Grassland fire hazard ≤50 when grassland curing ≥70% & Overall fuel hazard ≤ high |
| PLANTATIONS | | |
| | Immature stands (<15 years old): | Maintain road pavements and reduce fuel hazard on road verges. Where possible, reduce fuel hazard on the western and northern edge of plantations (consider pruning and non-commercial thinning). Debris from thinning and pruning to be <1 m high, or mechanically crushed if near ignition sources or built assets. |
| | Mature stands (>15 years old) | Maintain road pavements and reduce fuel hazard on road verges. Minimize areas of untreated harvesting slash during the fire season. Harvest the edge row during commercial thinning to reduce fuel hazard beside fire trails. Where possible maintain fuel reduced zones (high pruned and well-spaced stands) on the western and northern edge of plantations. |

ESA = ACT Emergency Services Agency

**Table 28 Fuel management standards – other zones**

| ZONE | TREATMENT STANDARDS |
|---|---|
| Landscape Fire Management Zone | Fuel management standards not applied. |
| Agricultural Fire Management Zone | Requirements will be defined in bushfire operational plans, developed through the Farm Firewise program. |
| Aboriginal Fire Management Zone | Areas and sites of cultural significance. Within this zone, cultural burning and other land management treatments may occur to support traditional cultural practices. Any cultural burning is expected to be compatible with ecological requirements. |

# A5.1. EXPLANATORY NOTES – FUEL MANAGEMENT STANDARDS

## A5.1.1. Overall fuel hazard

Overall fuel hazard assessment is currently consistent with the Environment, Planning and Sustainable Development Directorate's Fuel Assessment Methodology. This encompasses the processes identified in:

1. *Overall fuel hazard guide*, 4th edition, Victorian Department of Sustainability and Environment, July 2010
2. Project Vesta. Fire in dry eucalypt forests: fuel structure, fuel dynamics and fire behaviour, JS Gould, WL McCaw, NP Cheney, PF Ellis, IK Knight and AL Sullivan, CSIRO/SCION, 2008

The process used for the assessment of bushfire fuels is included in Part one of the supporting information. Subsequent revisions or changes to methodologies may be applied as appropriate.

## A5.1.2. Grassland curing

Assessment of grassland curing is currently consistent with the *Victorian Country Fire Authority* grassland curing guide (CFA, 2000). Subsequent revisions or changes to methodologies may be applied as appropriate.

## A5.1.3. Grassland fuel hazard

A combination of height (measured from the ground to maximum height of the seed head) and cover is currently used to determine triggers for short-to-medium term treatments when grasses are sufficiently cured to carry free-burning fires (approximately 70% cured). Although significant variation exists, grass height (m) and cover (%) are related to fuel load and visibility, which are important factors affecting the ability to suppress grassfires. A score (the Grassland Fuel Hazard – see Table 29) was developed for the ACT and derived by multiplying these two factors, which provides a means of defining allowable fuel conditions in Outer Asset Protection Zones and Strategic Firefighting Advantage Zones. Subsequent revisions or changes to methodologies may be applied as appropriate.

**Table 29 Grassland Fuel Hazard scores**

| HEIGHT (M) | COVER (%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **10** | **20** | **30** | **40** | **50** | **60** | **70** | **80** | **90** | **100** |
| **0.1** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **0.2** | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| **0.3** | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 |
| **0.4** | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 |
| **0.5** | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| **0.6** | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 |
| **0.7** | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 |
| **0.8** | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 |
| **0.9** | 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90 |
| **1.0** | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

Management of grassland fuels will be informed by the grass curing, when it reaches the following levels, as assessed by the ACT Rural Fire Service:

> At 50 % curing – consideration will be given to commencing maintenance of grass lands for bushfire mitigation.

> At 60 % curing – grassland fuel management will be prioritised by ACT Government land managers within identified zones.

> At 70% curing – Grassland IAPZ's must meet the following:

- 200mm maximum grass height (Grass height is recorded by measuring from the base of the grass to the top of the seed head. This measurement is then averaged across the area being assessed.)
- Across 80% of the IAPZ (100% in IAPZs established after 2022). Concession may be made in consultation and with approval from ESA.

### A5.1.4. Grass Curing

Most grass species have a life cycle in which after flowering, the plant dies or becomes dormant and dries out. This process is termed curing.

As grasses cure, the amount of moisture within the grass decreases and the amount of dead material in the grassland increases, heightening the potential for fire to ignite and spread in these fuels.

Grass curing is measured as a percentage of dead material in a grassland.

**Table 30 Grass curing – key attributes**

| | % CURED | COLOUR | SEED HEAD DEVELOPMENT | LANDSCAPE FEATURES |
|---|---|---|---|---|
| **Green Phase** | 0 | Green | From beginning of grass growth to commencement of seed head development | Landscape is entirely green, no seed heads visible |
| | 10 | Green | Seed heads formed and flowering | Landscape is entirely green with green seed heads visible |
| | 20 | Green, Yellow | Seed heads maturing and seeds beginning to drop | Seed heads change colour; first easily visible appearance of dead material in the landscape |
| | 30 | Green, Yellow | Most seed heads mature and seed dropping | Yellowing becoming apparent in leaves |
| **Yellow Phase** | 40 | Yellow, Green | Most seed heads mature and seed dropping | Green, with yellowing a significant part of landscape |
| | 50 | Yellow, Green | Up to one-half of all stems have dropped their seed | Landscape half green and half yellow |
| | 60 | Yellow, Green | Over one-half of all stems have dropped their seed | Yellow, with green a significant part of landscape |
| **Dry Phase** | 70 | Yellow - Straw. Lower third of stalk may be green | Most seed heads have dropped their seed | Minor amount of green or greenish-yellow visible in landscape |
| | 80 | Yellow - Straw | Almost all seed heads have dropper their seed | Non-significant amount of green or greenish-yellow visible in landscape |
| | 90 | Straw. Odd individual stalk may be green | Essentially all seed has dropped | Very little green showing anywhere, some green in wetter areas such as roadside and river valleys |
| | 100 | Bleached. All stalks fully cured. | All seed heads have dropper their seed | No green anywhere in landscape |

### A5.1.5. Grass Height

Grass height is recorded by measuring from the base of the grass to the top of the seed head. This measurement is then averaged across the area being assessed.

**Figure 20. Grass height**

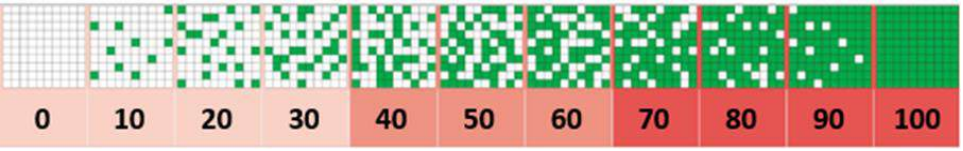

### A5.1.6. Grass Cover

Grass cover is a measure of continuity or how easily a fire can spread from one area to another. i.e., in a paddock, can a fire spread between the clumps of grasses.

The easiest way to visualise grass fuel cover is to image having a birds-eye view from above to assess how much of an area has grass cover.

Grass cover is measured in intervals of 10%

**Figure 21. Grass cover**



# ABBREVIATIONS, DEFINITIONS AND REFERENCES

## ABBREVIATIONS

### AS 3959

Australian Standard AS 3959:2018 Construction of buildings in bush fire-prone areas as amended.

### AS 2419.1 (as referenced)

Australian Standard AS 2419.1 (as referenced) Fire hydrant installations System design, installation, and commissioning.

### AS/NZS 1221:1997

Australian Standard AS/NZS 1221:1997 Fire hose reels

### AS 2441:2005

Australian Standard AS 2441:2005 Installation of fire hose reels

### AS 3745:2010

Australian Standard AS 3745:2010 Planning for emergencies in facilities

### AS/NZS 1530.8.1

Australian Standard AS 1530.8.1:2018 Methods for fire tests on building materials, components, and structures - Tests on elements of construction for buildings exposed to simulated bush fire attack - Radiant heat and small flaming sources.

### AS/NZS 1530.8.2

Australian Standard AS 1530.8.2:2018 Methods for fire tests on building materials, components, and structures - Tests on elements of construction for buildings exposed to simulated bush fire attack - Large flaming sources.

### AS/NZS 1596:2014

Australian Standard AS/NZS 1596:2014 The storage and handling of LP Gas

| | |
|---|---|
| **ACTF&R** | ACT Fire and Rescue |
| **ACTRFS** | ACT Rural Fire Service |
| **AIC** | Asset Interface Classification |
| **APZ** | Asset Protection Zone |
| **BAL** | Bush Fire Attack Level |
| **BAZ** | Bushfire Abatement Zone |
| **BCA** | Building Code of Australia |
| **BPA** | Bush fire prone area |
| **BPA Map** | Bush fire prone area map |
| **BFDB** | Bush Fire Design Brief |
| **BOP** | Bushfire Operation Plan |
| **BPA** | Bushfire Prone Area |
| **BPM** | Bush fire protection measure |
| **DA** | Development application |

| | |
|---|---|
| **Emergencies Act** | ACT *Emergencies Act 2004* |
| **EPSDD** | Environment, Planning & Sustainable Development Directorate |
| **ESA** | ACT Emergency Services Agency |
| **FBI** | Fire Behaviour Index |
| **FDI** | Fire Danger Index |
| **FFDI** | Forest Fire Danger Index |
| **IAPZ** | Inner Asset Protection Zone |
| **kW/m2** | Kilowatts per metre squared. |
| **NASH** | National Association of Steel Framed Housing (2014) Steel Framed Construction in Bush Fire Areas |
| **NCC** | National Construction Code |
| **PBP** | NSW RFS Planning for Bush Fire Protection 2019 |
| **PCS** | Parks and Conservation Service of EPSDD |
| **NSW RFS** | NSW Rural Fire Service |
| **RFMP** | Regional Fire Management Plan of PCS |
| **SBMP** | ACT Strategic Bushfire Management Plan |
| **SFAZ** | Strategic Fire Advantage Zone |
| **SFR** | Short fire run. |

# DEFINITIONS

A word or expression used in this document has the same meaning as it has in the ACT Strategic Bushfire Management Plan, unless otherwise defined in this document.

References in this document to legislation or a policy, guideline or standard are taken to be references to that legislation or a policy, guideline or standard as amended from time to time.

### Acceptable solution

Measures which have been deemed to meet the specified performance criteria.

### Assembly point

An area or building or structure that is used to assemble people or that have evacuated from a site in an emergency.

### Asset Protection Zone (APZ)

A fuel-reduced area surrounding a built asset or structure which provides a buffer zone between a bush fire hazard and an asset. The APZ includes a defendable space within which firefighting operations can be carried out. The size of the required APZ varies with slope, vegetation and FFDI.

### Asset Interface Classification

Land management zoning on public land interface.

### Australian Standard AS 3959 (AS 3959)

AS 3959:2018 Construction of buildings in bush fire-prone areas, Standards Australia, 2018.

### BAL certificate

A certificate issued to identify the BAL of a proposed development in the complying development process.

### Brownfield Development

Buildings developed on sites previously used for industrial or commercial purposes are termed brownfield developments. In some cases, brownfield sites have pre-existing structures.

### Bushfire Operational Plan, (BOP)

Required for certain land under *Emergencies Act 2004* Sect 78

### Bush fire assessment report

A report submitted with DA which establishes compliance with Bushfire Management Standards. The report assesses bush fire attack level and details all proposed bushfire protective measures.

### Bush Fire Attack Level (BAL)

A means of measuring the severity of a building's potential exposure to ember attack, radiant heat, and direct flame contact. In the NCC, the BAL is used as the basis for establishing the requirements for construction to improve protection of building elements.

### Bush fire

An unplanned fire burning in vegetation; also referred to as wildfire.

### Bush fire attack

Attack by embers, radiant heat or flame generated by a bush fire.

### Bush fire hazard

Any vegetation that has the potential to threaten lives, property, or the environment.

### Bush fire prone land

An area of land that can support a bush fire or is likely to be subject to bush fire attack, as designated on the ACT Bushfire Prone Area, (BPA), map.

### Bush fire prone area map (BPA map)

A map prepared for and approved by the ESA Commissioner defining the extent of bushfire prone land within the ACT.

### Bush fire protection measures (BPMs)

A range of measures used to minimise the risk from a bush fire that need to be complied with. BPMs include APZs, construction provisions, suitable access, water and utility services, emergency management and landscaping.

### Bush fire risk

Is the likelihood and consequence of a bush fire igniting, spreading, and causing life loss or damage to buildings of value to the community.

### Certifier

As defined in the Construction Occupations (Licensing) (Qualifications) Declaration 2024 (No 3) or current declaration.

### Consent authority

EPSDD assesses development proposals under the *Planning Act 2023*.The Emergency Services Agency is a referral entity.

### Defendable space

An area adjoining a building that is managed to reduce combustible elements free from constructed impediments. It is a safe working environment in which efforts can be undertaken to defend the structure, before and after the passage of a bush fire.

### Development

As defined in the *Planning Act 2023*.

### Development application (DA)

An application for consent to carry out development such as building, subdivision, or the use of a building or land. Applications are normally made to EPSDD.

### Development footprint

The building envelope or area shown on a plan on which buildings and associated APZs are proposed to be located.

### Ecologically sustainable development

An approach to development that considers ecological factors and the need to conserve biodiversity and protect ecological systems.

### Effective slope

The land beneath the vegetation which most significantly effects fire behaviour, having regard to the vegetation present.

### Exit

A doorway opening to a road or open space, as defined in the NCC.

### Farm FireWise

The ACT RFS Farm FireWise program supports the objective of planned fire management across rural lands.

### Fire Behaviour Index (FBI)

The FBI runs from 0 to 100 and beyond, with increasingly high values indicating increasingly dangerous fire behaviour and therefore fire danger risk.

### Fire Danger Index

Now superseded by FBI, Forest Fire Danger Index of 100 is still relevant as the design fire weather input for AS 3959 Method 2 calculations in the ACT.

### Flame zone

The distance from a bush fire at which there is significant potential for sustained flame contact to a building. The flame zone is determined by the calculated distance at which the radiant heat from the design fire exceeds 40kW/m².

### Grasslands

Grassed areas capable of sustaining a fire. Under AS 3959, this is identified as low open shrubland, hummock grassland, closed tussock grassland, tussock grassland, open tussock, sparse open tussock, dense sown pasture, sown pasture, open herb field, and sparse open herb field.

Grass, whether exotic or native, which is regularly maintained at or below 10cm in height (including maintained lawns, golf courses, maintained public reserves, parklands, nature strips and commercial nurseries) is regarded as managed land.

### Grassland Deeming Provisions

An acceptable solution applying to properties in grassland hazard areas which can be used instead of the site assessment procedure in AS 3959.

### Greenfield Development

Greenfield development is any kind of real estate development in previously undeveloped areas. The new development can be of any variety of land use – residential, commercial, industrial, or infrastructural. It's the previous state of the land that determines whether a new development is a greenfield development.

### Residential infill development

Refers to the development of land by the erection of or addition to a building, which is within an existing allotment and does not require the spatial extension of services. Existing services may include public roads, electricity, water, or sewerage. See also Infill Development.

### Infill Development

Infill development refers to the construction of buildings or other facilities on previously unused or underutilized land located within an existing urban–or otherwise developed–area. This type of development is meant to encourage density and accommodate environmentally sustainable urban growth by making use of existing utility and transportation infrastructure.

### Inner Asset Protection Zone (IAPZ)

The component of an APZ which is closest to the asset (measured from unmanaged vegetation). It consists of an area maintained to minimal fuel loads so that a fire path is not created between the hazard and the building.

### Managed land

Land that has vegetation removed or maintained to a level that limits the spread and impact of bush fire. This may include developed land (residential, commercial, or industrial), roads, golf course fairways, playgrounds, sports fields, vineyards, orchards, cultivated ornamental gardens and commercial nurseries. Most common will be gardens and lawns within curtilage of buildings. These areas are managed to meet the requirements of an APZ.

### Multi-storey buildings

Buildings exceeding three storeys in height are multi-storey buildings. The rise in storeys should be the calculated as per the definition within Volume 1 of the NCC.

### National Construction Code (NCC)

The National Construction Code, published by the Australian Building Codes Board, comprising the Building Code of Australia as Volumes One and Two, and the Plumbing Code of Australia as Volume Three.

### Performance-based solution

A method of complying with the performance criteria other than by an acceptable solution.

### Primitive camping

A site which is part of a commercially operated venture where there may already be a site for a tent and a fire pit.

### Setback

The distance required by planning provisions to separate a building from the bush fire hazard, street frontage or from adjacent buildings or property boundaries.

### Short fire run.

A parcel or area of vegetation which is of lower risk than the design fire associated with that in AS 3959 due to its size, shape, and orientation to buildings. This has a design fire head width of less than 100m.

### Sensitive use development

Developments where the vulnerable nature of the occupants means that a lower radiant heat threshold needs to be accommodated to allow for the evacuation of occupants and emergency services.

### Subdivision

The surrender of one or more leases held by the same lessee, and the granting of new leases to separate those parcels of land.

### Suitably qualified consultant

A consultant providing bush fire assessments and BAL Certificates who has been accredited by a recognised accreditation scheme.

### Tourist accommodation

A building or place that provides temporary or short- term accommodation on a commercial basis including backpackers accommodation, bed and breakfast accommodation, farm stay accommodation, hotel or motel accommodation and serviced apartments.

### Vegetation classification

Vegetation types identified using the formations and classifications within Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and the ACT (Keith, 2004).

# REFERENCES

Alexander, M.E. (1982) “Calculating and Interpreting Forest Fire Intensities.” Can. J. Bot. 60;349-357

AUSLIG (1990) “Atlas of Australian Resources. Third Series, Volume 6, Vegetation”. Commonwealth of Australia

Australia ICOMOS (2004) Illustrated Burra Charter

Australian Building Codes Board (2019). National Construction Code Volume One - Building Code of Australia. ABCB

Australian Building Codes Board (2019). National Construction Code Volume two - Building Code of Australia. ABCB.

Australian Building Codes Board (2014). Performance Standards for Private Bushfire Shelters. ABCB.

Australian Building Codes Board (2014). Design and Construction of Community Bushfire Refuges. ABCB.

Butler B.W., Cohen, J.D. (1998). Firefighter safety zones: how big is big enough? Fire Management Notes. Vol. 58, 13–16

Butler, B.W., Cohen, J.D. (1998). Firefighter safety zones: a theoretical model based on radiative heating. International Journal of Wildland Fire. Vol. 8, 73–77.

Byram, G.M. (1959). Combustion of Forest Fuels in: “Forest Fire Control and Use” (Ed. Davis, K.P.) McGraw-Hill, New York.

Catchpole, W.R., Bradstock, R.A., Choate, J., Fogarty, L.G., Gellie, N., McCarthy, G.J., McCaw, W.L., Marsen-Smedley, J.B. and Pearce, G. (1998) Cooperative Development of Equations for Heathland Fire Behaviour. In ‘Proc. 3rd Int. Conference. Forest Research and 14th Conf. on Fire and Forest Meteorology”. (Ed. Viegas, D.X.) Luso, Coimbra, Portugal, 631-645.

Cheney P. and Sullivan A. (undated) “Comment on Risk Analysis Process for NSW.” CSIRO Forest and Forest Products Division.

Cheney P. and Sullivan A. (2008) Grassfires. CSIRO Publishing.

COAG (2011) National Disaster Resilience Strategy.

CSIRO (2000) “Review of Current Methodology of Assessment of Bush fire Hazard and the Prescription of Appropriate Separation Distances and Building Standards. The Development of a Robust Model to Achieve this for Different Vegetation Types.” Client Report 901, CSIRO Forestry and Forest Products Divisions Bush fire Behaviour and Management Team, ACT.

CSIRO (2005) “Review of Methodology for prescribing separation distances between structures and vegetation.” Client Report No.1537, CSIRO Forestry and Forest Products Division, Feb. 2005.

Douglas, G.B. and Ellis, P. (2001) “Integrating Land Use Planning and Construction Standards for Protection of Bush Fires in NSW – a Model”. Bushfire 2001, Christchurch, New Zealand.

Douglas, G.B. and Tan, Z. (2005) Integrating Site Assessment and Performance Planning Outcomes for Bushfire Prone Areas at “Planning for Natural Hazards – How we can Mitigate the Impacts?” Symposium, University of Wollongong, 2-5 February 2005, Wollongong.

Douglas, G.B., Tan Z. and Midgley S. (2006) A Verification Method for Evaluating Alternative Building Solutions in Bushfire-Prone Areas at International Fire Safety Engineering Conference 2006, Gold Coast, 23 May 2006.

Forestry Commission of NSW (1991) Control Burning in Eucalypt Forests, Metric Conversion of McArthur Leaflet 80, Sydney.

Gill, A.M. et al. (ed) (1981) “Fire and the Australian Biota” Australian Academy of Science, Canberra.

Good R. (1994) “Fuel Dynamics, Preplan and Future Research Needs”. Pers. Communication.

Haddad, S.G. (1982) “A Systematic Approach to Risk Assessment for Major Plants”, CHEMECA ’82, University of Sydney.

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.

Luke R.H. and McArthur, A.G. (1978) “Bush Fires in Australia” Australian Government Publishing Service, Canberra.

National Association of Steel Framed Housing (2014). “Steel Framed Construction in Bush Fire Areas. NASH

Noble, I.R., Bary, G.A.V. and Gill, A.M. (1980) McArthur’s fire-danger meters expressed as equations. Aust. J. Ecology 5;201-203.

NSW Department of Planning, Industry and Environment (2013) Circular PS 13-006 EP&A Amendment (Bushfire Prone Land) Regulation 2014.

NSW Department of Planning, Industry and Environment (2012) Circular PS 12-004 Development assessment on bush fire prone land - Section 79BA.

NSW Department of Planning, Industry and Environment (2013) Circular PS 13-003 Proclamation of certain provisions of the *EP&A Amendment Act 2012*.

NSW Department of Planning, Industry and Environment (2010) PS 10-028 *Environmental Planning & Assessment Amendment Act 2008* - Commencement Proclamation - bush fire prone land

NSW Department of Planning, Industry and Environment (2012) Circular PS 12-003 Initiatives to improve housing supply.

Purton, C.M. (1982). Equations for the McArthur Mark 4 Grassland Fire Danger Meter. Bureau of Meteorology, Meteorological Note 147.

Raj, P. (2008). A review of the criteria for people exposure to radiant heat flux from fires. Journal of Hazardous Materials. Vol. 169, issue 1, 61-71.

Ramsay, C and Rudolph, L (2003) “Landscape and Building Design for Bush fire Areas”. CSIRO Publishing, Collingwood.

Ramsay G.C. and Dawkins D. (eds), (1993) “Building in bush fire prone areas – information and advice”, Standards Australia [SAA HB 36-1993].

Resources and Energy NSW (2016). ISSC 3 Guide for the Managing Vegetation in the Vicinity of Electrical Assets. NSW Government

Rural Fire Service NSW (2005) “Standards for Asset Protection Zones”

Standards Australia (1997). “AS/NZS 1221 Fire hose reels”.

Standards Australia (2005). “AS 2441 Installation of fire hose reels”.

Standards Australia (2005). “AS 2419.1 Fire hydrant installations - System design, installation and commissioning.”

Standards Australia (2010). “AS 3745:2010 Planning for emergencies in facilities.”

Standards Australia (2018). “AS/NZS 1530.8.1 Methods for fire tests on building materials, components and structures - Tests on elements of construction for buildings exposed to simulated bush fire attack - Radiant heat and small flaming sources.”

Standards Australia (2018). “AS 3959, Construction of buildings in bush fire prone areas”.

Standards Australia (2018). “AS/NZS 1530.8.2 Methods for fire tests on building materials, components and structures - Tests on elements of construction for buildings exposed to simulated bush fire attack - Large flaming sources.”

Standards Australia (2014). “AS/NZS 1596 The storage and handling of LP Gas”.

Watson P. (2005) Chapter 9 Fuel Accumulation in “Fire Frequencies for Western Sydney’s Woodlands: Indications from Vegetation Dynamics” Doctor of Philosophy, University of Western Sydney.

Webster, Joan (2000), “The Complete Bushfire Safety Book.” Random House.

Wilson A.A.G (1984) “Assessing the Bushfire Hazard of Houses: A Quantitative Approach”. Rural Fire Research Centre, Vic.

Wilson, A.A.G. and Ferguson I.S. (1984) “Australian Forestry”, pp230-236. “Fight or Flee? – A Case Study of the Mount Macedon Bush Fire.”

Notes:

ACT Government

JUSTICE AND COMMUNITY SAFETY DIRECTORATE
ACT EMERGENCY SERVICES AGENCY

JULY 2023