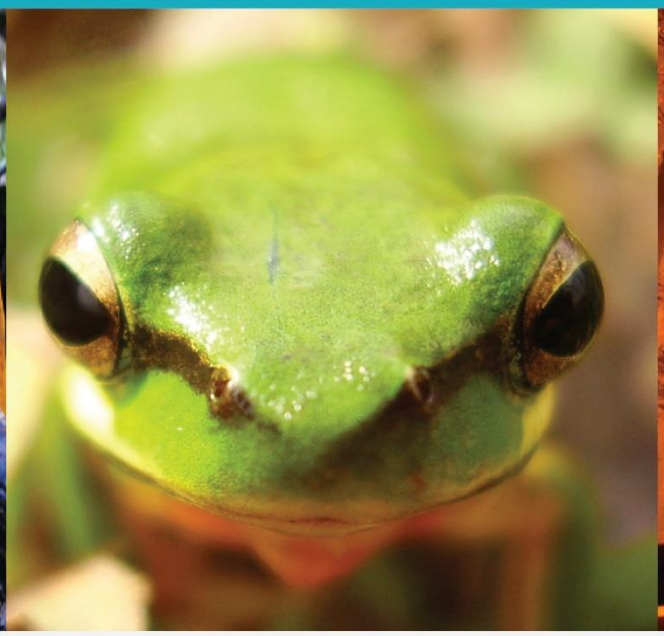
Appendix X

Bushfire protection assessment

TRAVERS BUSHFIRE & ECOLOGY

A TBE ENVIRONMENTAL COMPANY


BUSHFIRE PROTECTION ASSESSMENT

Proposed Woodlawn Advanced Energy Recovery Centre

Collector Road

Tarago

Under Section 4.14 of the EP&A Act 1979

14 July 2022

(REF: 19EMM09)

BUSHFIRE PROTECTION ASSESSMENT

Proposed Woodlawn Advanced Energy Recovery Centre

Collector Road, Tarago

Report Authors:	Morgan Jeffery B. Sc. Heath Fitzsimmons B.Sc., BPAD-L2 56336 John Travers B. App. Sc., Ass. Dip., Grad. Dip., BPAD-L3
Plans prepared:	Emma Buxton B. Sc.
Checked by:	John Travers B. App. Sc., Ass. Dip., Grad. Dip., BPAD-L3
Date:	14/07/22
File:	19EMM09

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Disclaimer:

This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person, including the client, then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be relied upon as meaning it reflects any advice by this firm. The report does not suggest or guarantee that a bush or grass fire will not occur and or impact the development. This report advises on policies and specifications published by the NSW Rural Fire Service e.g., Planning for Bush Fire Protection 2019.

The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

EXECUTIVE SUMMARY

This bushfire protection assessment has been undertaken for a proposed Woodlawn Advanced Energy Recovery Centre, Collector Road, Tarago.

The proposed development is categorised by the NSW Rural Fire Service (NSW RFS) planning policy document *Planning for Bush Fire Protection 2019* (PBP 2019) as 'other development', and more specifically 'commercial and industrial development' and 'hazardous industry'.

For this type of development, NSW RFS requires that development applications should satisfy the aims and objectives of PBP 2019, propose an appropriate combination of bushfire protection measures and provide evidence that the intent of each measure can be satisfied. In accordance with PBP 2019 this suite of bush fire protection measures is based on the requirements for residential development.

This assessment has found that bushfire may affect the proposed development, with potential exposure to radiant heat and ember attack from existing minimal woodland vegetation to the north-east and the proposed landscaping/revegetation areas to the north-east and south-east.

In recognition of the bushfire risk posed to the site by nearby bushland, *Travers bushfire & ecology* propose the following combination of bushfire measures;

- Building construction for exposed aspects in accordance with the requirements for Bushfire Attack Level BAL-12.5 on all aspects,
- Asset Protection Zones (APZ) for all National Construction Code (NCC) class 5-8 buildings commensurate with the above construction standards, as determined in accordance with Table A1.12.2 of *PBP 2019*,
- Provision of access, water, electricity and gas supply in accordance with the acceptable solutions for residential infill development outlined in *PBP 2019*,
- Preparation of a Bush Fire Emergency Management and Evacuation Plan.

In addition to the recommendations above, additional measures include:

- Recommendations made by *Riskcon Engineering* (Riskcon) dated June 2022 in their Fire Safety Study of the development, and
- Recommendations and assumptions made by *Sherpa Consulting Pty Ltd* dated July 2022 in their Preliminary Hazard Analysis of the development.

The totality of these items has been assessed in the Environmental Impact Statement (EIS) for the project, and are beyond the scope of this assessment. Where bushfire measures align with the additional measures, they are identified within this assessment.

Note 1: *Riskcon* summarised that their analysis that several fire scenarios may result in substantial radiant heat impacts which may render fire protection systems inoperable. Where fire protection systems may be affected by fire scenarios recommendations were made regarding the location of installed fire protection. Based on analysis, they concluded that 'should the protection systems be located per the recommendations of their report, the services should be capable of combating the modelled fire scenarios'.

Note 2: *Sherpa Consulting* concluded that offsite effects due to fire or explosion involving Dangerous Goods Class 4.2 materials and hazardous scenarios associated with the ARC operations were considered unlikely. Consequence assessment confirmed that the acute safety impacts would be localised and contained on site. This was due to (the) proposed design measures and that these areas are well separated from the site boundary. It is therefore very unlikely that an accident event involving hazardous materials would have any effect that could extend offsite.

They also advised that the preliminary hazard analysis was classified as a Level 1 study with reference to the Multi-Level Risk Assessment guideline. Comparison of safety effects to surrounding land uses or environmental effects to surrounding ecosystems due to accident events indicated that all HIPAP 4 qualitative risk criteria are met by the proposed development, hence the offsite risk can be considered low.

GLOSSARY OF TERMS

AHIMS	Aboriginal Heritage Information System
APZ	asset protection zone
AS1596	*Australian Standard – The storage and handling of LP Gas*
AS2419	*Australian Standard – Fire hydrant installations*
AS3745	*Australian Standard – Planning for emergencies in facilities*
AS3959	*Australian Standard – Construction of buildings in bushfire-prone areas 2018*
BAL	*bushfire attack level*
BCA	*Building Code of Australia*
BSA	bushfire safety authority
DA	development application
DLUP	Development Land Use Plan
EEC	Endangered ecological community
EP&A Act	*Environmental Planning & Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
FFDI	forest fire danger index
IPA	inner protection area
LEP	Local Environmental Plan
LGA	local government area
m	metres
NASH	*NASH Standard – Residential and Low-Rise Steel Framing*
NCC	*National Construction Code*
OPA	outer protection area
PBP 2019	*Planning for Bush Fire Protection 2019*
RF Act	*Rural Fires Act 1997*
NSW RFS	NSW Rural Fire Service
SFR	short fire run
SFPP	special fire protection purpose
TBE	*Travers bushfire & ecology*

TABLE OF CONTENTS

TABLE

FIGURES

ATTACHMENTS

1. INTRODUCTION

Travers bushfire & ecology has been engaged to undertake a bushfire protection assessment for the proposed Woodlawn Advanced Energy Recovery Centre located at Collector Road, Tarago. The project area is partially mapped as bushfire prone (Vegetation Category 3 and buffer) on the Goulburn Mulwaree Council Bush Fire Prone Land Map (refer Figure 1-1). Vegetation Category 3 is considered to be medium bushfire risk vegetation and includes grasslands, freshwater wetland, semi-arid woodland, alpine complex and arid shrublands (NSW RFS 2015). This triggers an assessment by the consent authority in respect of S4.14 of the *Environmental Planning and Assessment Act 1979* and the provisions of *Planning for Bush Fire Protection (PBP 2019).*

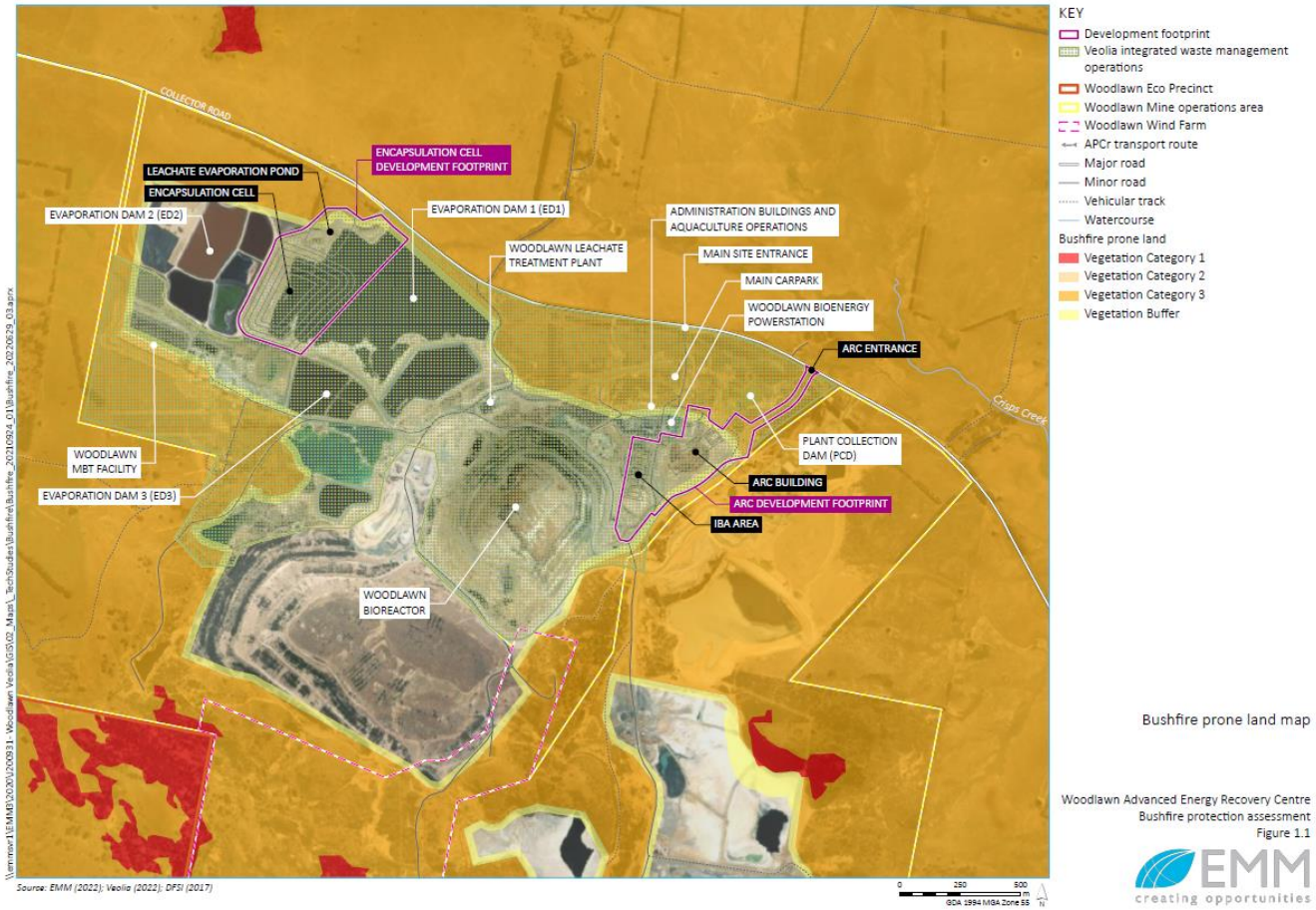


Figure 1-1 – Bushfire Prone Land Map
(Source: NSW Planning Portal, 2022 / EMM 2022)

1.1 Aims of the assessment

The aims of the bushfire protection assessment are to:

- review the bushfire threat to the landscape
- undertake a bushfire attack assessment in accordance with *PBP*
- propose a suitable package of bushfire protection measures commensurate with the level of risk to the development
- assess the degree to which the proposed package of bushfire protection measures meets the aim and objectives of *PBP* 2019 and any relevant performance criteria

1.2 Proposed development

The proposal is for the construction of an energy recovery facility (ERF) within an existing integrated residual waste management facility. The ERF is primarily comprised of a thermal treatment plant for combustion of waste feedstock and associated infrastructure including roads. Figure 1-2 shows the proposed site layout.

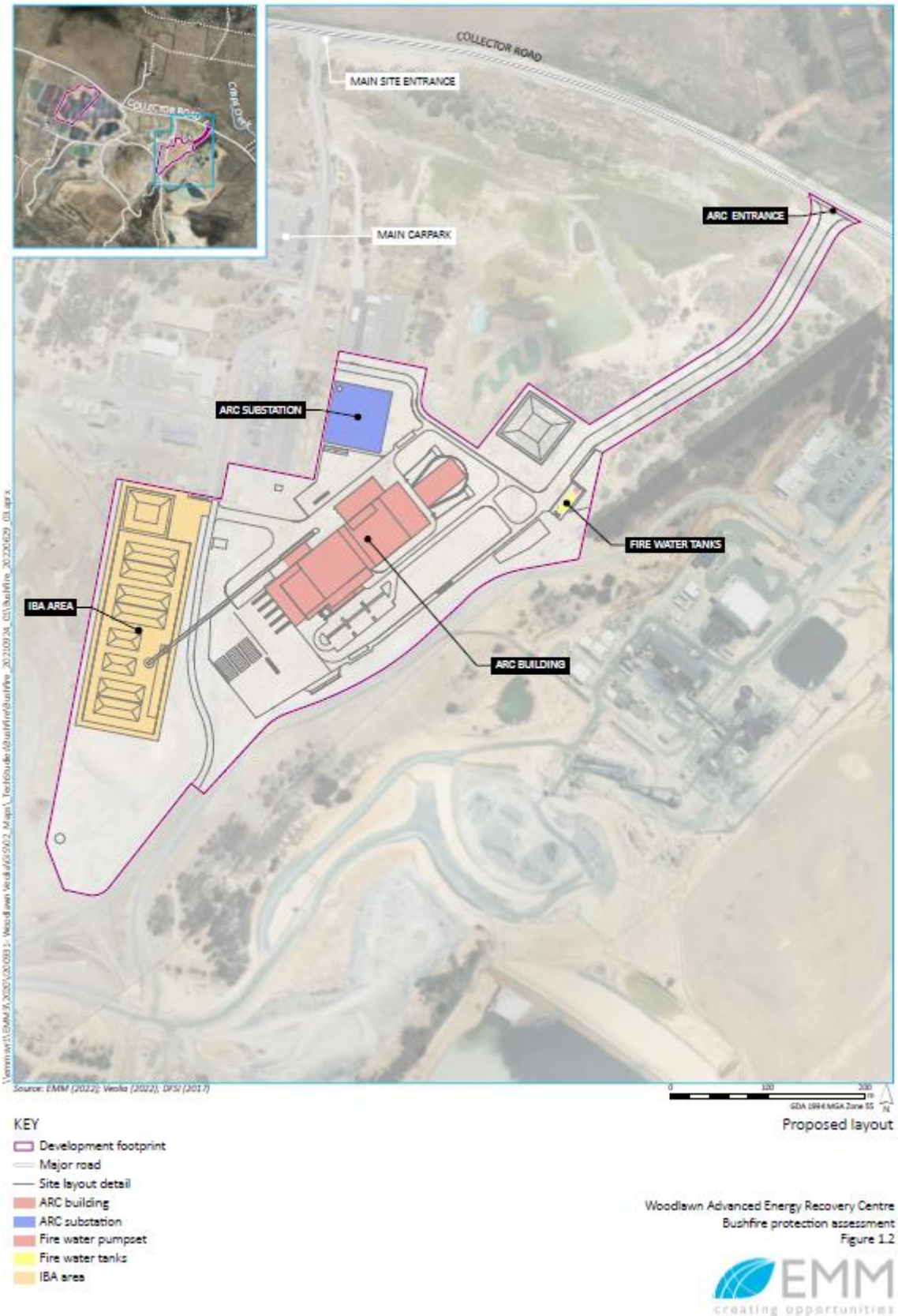


Figure 1-2 – Proposed Layout Plan

(Source: EMM 2022)

1.3 Information collation

Information sources reviewed for the preparation of this report include the following:

- Woodlawn Eco Precinct Preliminary Concept Plan, prepared by Nettleton Tribe. Dated July 2021;
- Riskon Engineering Report, Fire Safety Study, Reference: (RCE-21129_WoodlawnARC_FSS_Final_10Jun22_Rev(4)) Dated June 2022;
- Sherpa Consulting - Preliminary Hazard Analysis Report, Dated July 2022;
- *NearMap* aerial photography;
- Topographical maps DLPI of NSW 1:25,000;
- *Australian Standard 3959 Construction of buildings in bushfire-prone areas (2018);*
- *Planning for Bush Fire Protection 2019 (PBP 2019).*

1.4 Site description

The subject site is located at Collector Road, Tarago, in the Goulburn Mulwaree local government area (LGA). The site is located within the Woodlawn Eco Precinct, approximately 6km west of the town of Tarago, 50km south of Goulburn and 70km North of Canberra, NSW (refer Figure 1-3).

Land use zoning within the study area is predominantly IN3 Heavy Industrial, with the balance zoned RU2 Rural Landscape. The study area is comprised of a sparsely vegetated and highly modified landscape.

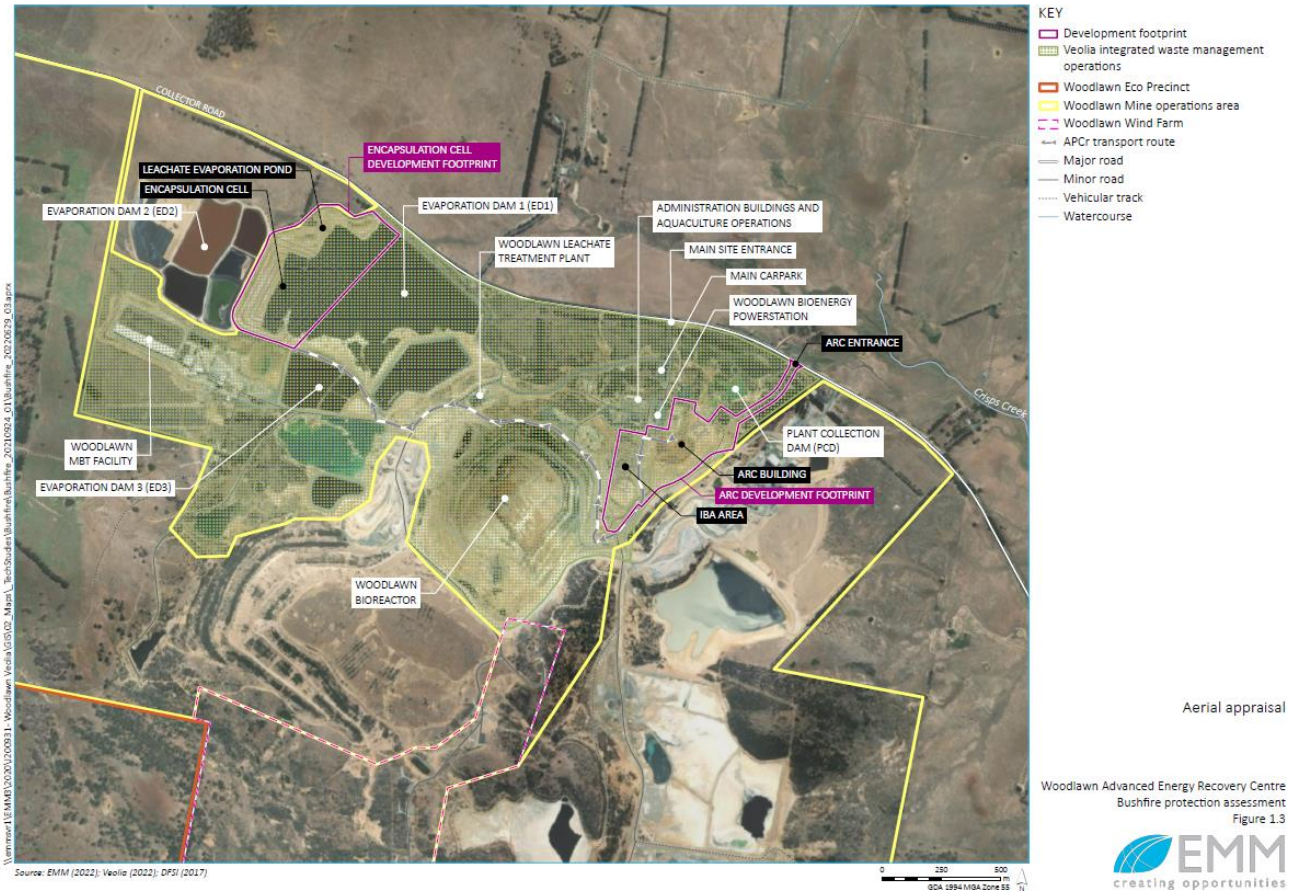


Figure 1-3 – Aerial appraisal
(source: EMM 2022)

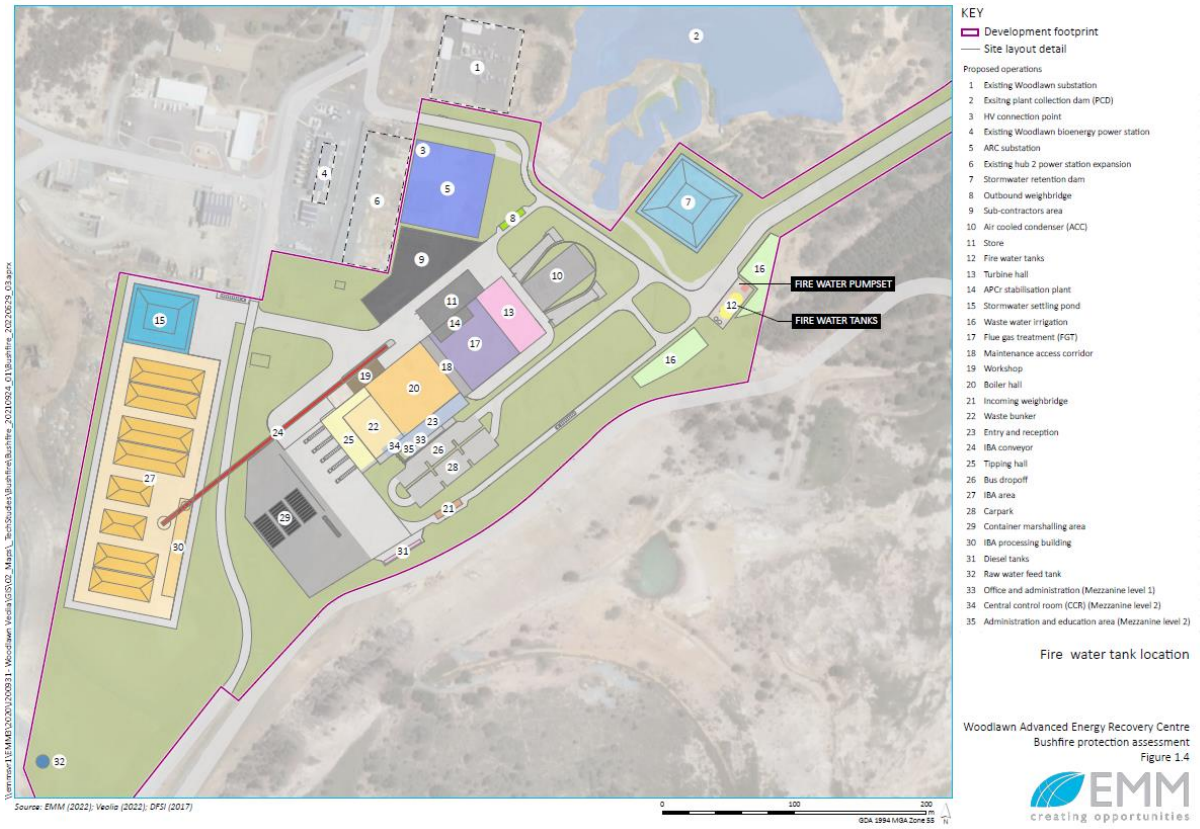


Figure 1-4 – Fire water Tank Location

(source: EMM 2022)

1.5 Legislation and planning instruments

The environmental planning parameters pertinent to the development can be summarised as provided in Table 1.1.

Table 1.1 – Environmental planning parameters

Is the site mapped as bushfire prone?	Yes
Proposed development type	Other development, buildings of Class 5-8 under the NCC, hazardous industry, commercial and industrial development.
Is the development considered integrated for the purposes of Section 100B of the *Rural Fires Act 1997?*	No
Is the proposal located in an Urban Release Area as defined under Clause 273 of the EP&A Regulations?	No
Zoning	IN3 – Heavy Industrial RU3 – Rural Landscape
Significant environmental features	None
Details of any Aboriginal heritage	Zero Aboriginal sites recorded in or near the subject location (AHIMS ID 615029)
Does the proposal rely on an alternative solution?	No

1.5.1 National Construction Code (NCC) and the Australian Standard AS3959

The *NCC* is given effect through the *EP&A Act* and forms part of the regulatory environment of construction standards and building controls.

The *NCC* does not provide for any bushfire specific performance requirements for commercial and industrial buildings (Classes 5-8) and, as such, the Australian Standard *Construction of buildings in bushfire-prone areas 2009 (AS3959)* does not apply as a set of deemed to satisfy provisions. However, compliance with AS3959 and the *NASH Standard - Residential and Low-rise Steel Framing* (NASH Standard) must be considered when meeting the aims and objectives of PBP 2019.

1.5.2 Planning for Bush Fire Protection 2019 (PBP 2019)

PBP 2019 outlines the bushfire protection measures required to be assessed for new development in bushfire prone areas. For buildings identified of Class 5 to 8 under the NCC 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.

As the development is identified as 'hazardous industry' a performance-based solution is required in accordance with section 8.3.9 of *PBP 2019*. This must address the appropriate protection measures commensurate with the bush fire hazards and associated risks, and care should be taken to ensure that the development does not impact on existing developments.

Riskcon Engineering (06/22) undertook a *Fire Safety Study* of the development in accordance with HIPAP No 2 as well as FRNSW guidelines. They summarised that their analysis had found several fire scenarios which may result in substantial radiant heat impacts which may render fire protection systems inoperable. Where fire protection systems may be affected by fire scenarios recommendations were made regarding the location of installed fire protection. Based on their analysis, *Riskcon* concluded that 'should the protection systems be located per the recommendations of their report, the services should be capable of combating the modelled fire scenarios'

Sherpa Consulting (07/22) has undertaken a *Preliminary Hazard Analysis* and identified bushfire as an external risk with the potential to pose an ignition risk to the storage of flammable or combustible materials onsite. However, with reference to the APZ and other management measures such as Fire Safety Study and AS 1940:2017 *Storage and Handling of Flammable and Combustible liquids, Sherpa Consulting* concluded that the potential risk to the ARC is minimal.

In accordance with section 8.3.10 of *PBP 2019* a suitable package of bushfire protection measures should be proposed commensurate with the level of risk to the development. The provisions of Chapter 7 of *PBP 2019* should be used as a base for the development of this package of measures.

2. BUSHFIRE THREAT ASSESSMENT

To assess the bushfire threat and to determine the required width of an Asset Protection Zone (APZ) for a development, an assessment of the potential hazardous vegetation and the effective slope within the vegetation is required. These elements include the potential hazardous vegetation that may affect the site and the effective slope within that hazardous vegetation.

An APZ is a fuel reduced area surrounding a built asset or structure. This can include any residential building or major building such as farm and machinery sheds, or industrial, commercial or heritage buildings.

As outlined in the *Model Bushfire Risk Management Plan,* The Southern Tablelands Bush Fire Management Committee (BFMC) area has on average 265 bush fires per year, of which 5 could be considered to be large fires. Major fires occur sporadically with about 3 in a 5 year period. The frequency of significant or major fires has varied between the districts comprising the Southern Tablelands area. Generally, Goulburn/Mulwaree has a history of major fires occurring in a cycle of 5 to 7 years.

The main sources of ignition in the Southern Tablelands BFMC area are: Lightning, Escapes from legal burning off, Illegal burning off, Human error & Arson.

2.1 Hazardous fuels

PBP 2019 guidelines require the identification of vegetation formation in accordance with David Keith (2004) if using the simplified acceptable solutions in *PBP 2019*, or alternatively the vegetation class if adopting the comprehensive vegetation fuel loads (as allowable when undertaking an assessment under Method 2 of AS3959). The hazardous vegetation is assessed for a distance of at least 140m from a proposed building envelope.

Mapped vegetation within 140m of the proposed building footprint includes Grassy Woodland and a combination of vegetated and non-vegetated areas identified on the Bush Fire Prone Land Map as Category 3 Vegetation, assumed to be Grassland. The proposal also includes a settling pond, a plant collection dam and ‘storm water retention dam’ among other landscaped areas which, if unmanaged, could potentially contribute to the bushfire hazard.

Because a site assessment was impossible due to Covid-19 related restrictions on movement in the Greater Sydney Area, TBE has erred on the side of caution and considered Forests and Freshwater Wetlands to be the predominant vegetation formations for the purpose of this assessment. The results of this assessment are detailed in Table 2-1.

2.2 Effective Slope

The effective slope (post earthworks) has been assessed for up to 100m from the development site. Effective slope refers to that slope which provides the most effect upon likely fire behaviour. A mean average slope may not in all cases provide sufficient information such that an appropriate assessment can be determined. The effective slope is described within Table 2-1.

2.3 Bushfire attack assessment

The following assessment has determined the APZ and Bushfire Attack Level (BAL) levels via table A1.12.5 of *PBP 2019*.

BAL is a means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. It's measured in increments of radiant heat (expressed in kilowatts/m2).

A forest fire danger index (FFDI) of 100 has been used to calculate bushfire behaviour on the site based on its location within the Goulburn Mulwaree LGA. Table 2-1 provides a summary of the bushfire attack assessment and the resulting minimum APZ distance specified for residential subdivision (required to be used as a base for commercial development in accordance with section 8.3.10 of *PBP 2019)*. Figure 2.1 displays the APZ's and their location.

Table 2-1 – Bushfire attack assessment

Aspect	*Vegetation Formation*	*Effective Slope*	*Minimum APZ required*	*APZ provided*	*BAL Rating*
North-west	Low Threat Vegetation*	Flat/Upslope	Defendable Space	45m	BAL-12.5
North-east	Forest	0-5°	29m	54m	BAL-12.5
	Forest (ARC Substation)	0-5°	29m	40m	BAL-12.5
	Freshwater Wetland	0-5°	6m	54m	BAL-12.5
South-west	Low Threat Vegetation*	Flat/Upslope	Defendable Space	45m	BAL-12.5
South-east	Forest	0-5°	24m	54m	BAL-12.5

*For those aspects not exposed to hazardous vegetation, APZs based on Forest vegetation have been applied in order to impose restrictions on landscaping and ensure that no future incidental increase to bushfire risk occurs.

Note 1 – all information provided in Table 2-1 directly relates to Schedule 1. An image representation of an APZ is identified and outlined in Appendix 1.

Note 2 – The ARC Substation has been reduced to a BAL-12.5 due to the usage of the building as an unenclosed electrical substation, this building will house no fulltime workers and will have no walls.

Note 2 – Consult Appendix 2 for a definition between Bushfire Attack Levels

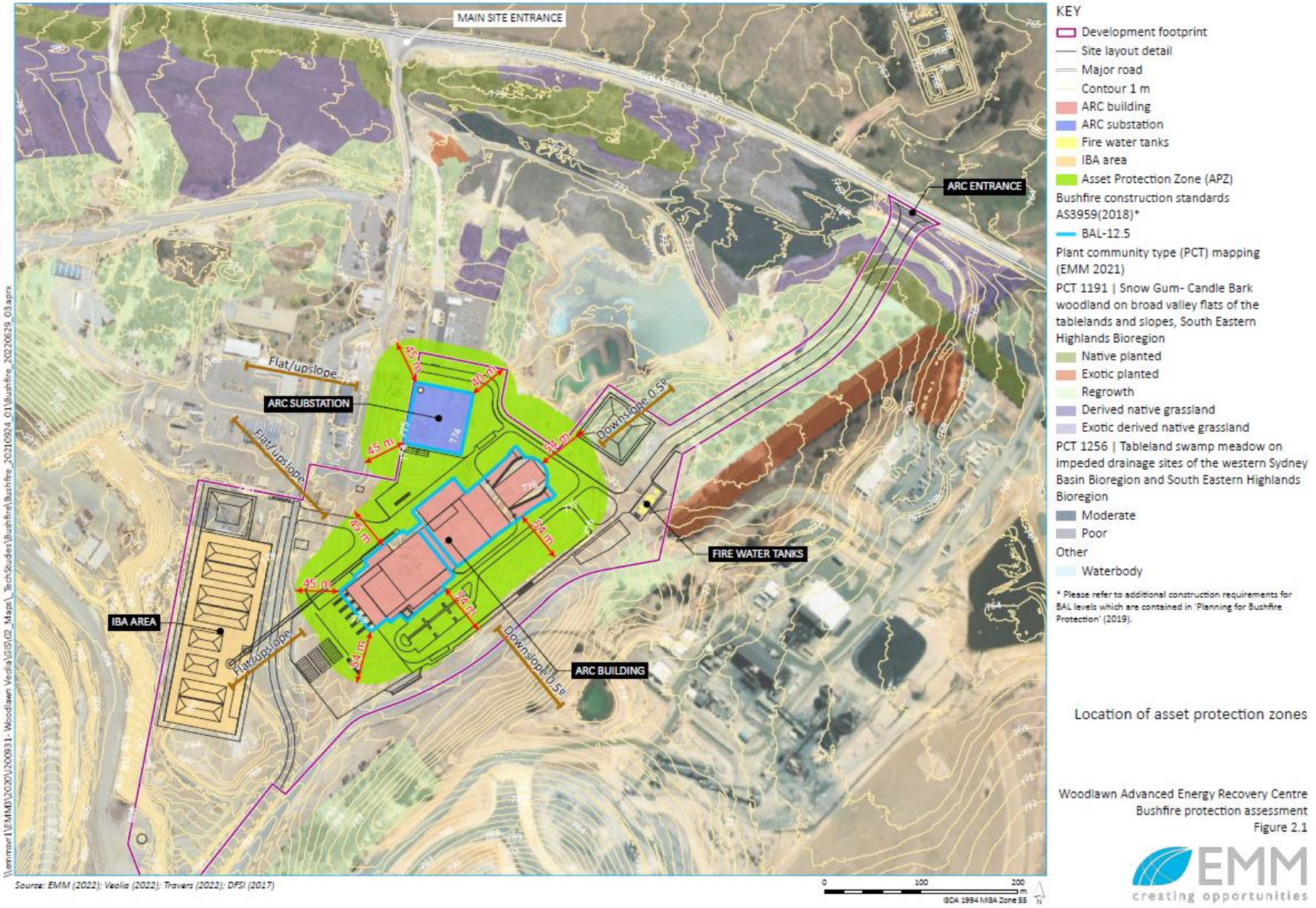


Figure 2-1– Location of Asset Protection Zones

(Source: EMM 2022)

3. SPECIFIC PROTECTION ISSUES

The intent of bushfire protection measures for commercial development is to minimise the risk of bush fire attack and provide protection for staff, contractors and emergency services personnel and others assisting firefighting activities.

In accordance with section 8.3.10 of *PBP* 2019 a suitable package of bushfire protection measures should be proposed commensurate with the level of risk to the development, with the provisions of Chapter 7 (Residential Infill Development) of *PBP 2019* used as a base for the development of this package of measures.

This section outlines the proposed package of bushfire protection measures and, where possible, assesses their compliance with the relevant performance criteria by comparison to the acceptable solutions in Chapter 7 (Residential Infill Development) of *PBP 2019*.

Where issues listed for the specific development purpose have no specific performance criteria the proposed performance solutions are assessed by comparison to the relevant Australian Standards. Discussions held during the assessment phase which identified the appropriate APZ have led to mitigation measures being incorporated into the detailed design of the project.

3.1 Asset protection zones (APZs)

Table 3.1 outlines the proposed performance solution and compliance with the performance criteria for APZs.

Table 3-1 – Performance criteria for asset protection zones (PBP 2019 guidelines pg. 65)

Performance criteria	***Project Solution***	***Compliance***		***Comment***
		Acceptable solution proposed	***Performance criteria proposed***	
APZs are provided commensurate with the construction of the building; and a defendable space is provided.	An APZ is proposed for all Class 5-8 buildings and any Class 10 buildings within 6m of a Class 5-8 building, as depicted at SCHEDULE 1. APZ distances determined in accordance with Table A1.12.5 in Appendix 1 of *PBP 2019*.	☑	☑	

Performance criteria	Project Solution	Compliance		Comment
		Acceptable solution proposed	Performance criteria proposed	
APZs are managed and maintained to prevent the spread of a fire to the building.	APZs to be managed in perpetuity in accordance with the requirements of Appendix 4 of *PBP* 2019 (see Appendix 1 of this document)	☑	☑	
The APZ is provided in perpetuity. APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised	APZs are wholly within the development site. APZs are located on lands with a slope less than 18 degrees.	☑	☑	

3.2 Access for firefighting operations

Table 3-2 outlines the proposed performance solution and compliance with the performance criteria for access.

Table 3-2 – Performance criteria for access (PBP 2019 Guidelines pg. 66)

Performance criteria	Project Solution	Compliance		Comment
		Acceptable solution proposed	Performance criteria proposed	
Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	Property access roads are two-wheel drive, all weather roads.	☑	☑	

Performance criteria	Project Solution	Compliance		Comment
		Acceptable solution proposed	Performance criteria proposed	
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 (up to 23 tonnes), bridges and causeways are to clearly indicate load rating.	☑	☑	
There is appropriate access to water supply.	There is a proposed reticulated water system powered by a diesel and electric pump system; which will supply the hydrant and sprinkler system. The water storage capacity is to be 1,350m^3. See Figure1-4.	☑	☑	
Firefighting vehicles can access the building/s and exit the property safely.	The internal road network provides numerous alternative access routes for all buildings.	☑	☑	
	Access roads have a minimum 4m carriageway width;	☑	☑	
	Access roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m at the passing bay;	☑	☑	

Performance criteria	Project Solution	Compliance		Comment
		Acceptable solution proposed	Performance criteria proposed	
	A minimum vertical clearance of 4m is maintained to any overhanging obstructions, including tree branches;	☑	☑	
	Internal roads are through-roads, and large hard-stand areas provide suitable turning areas exceeding the requirements of Appendix 3 of PBP 2019;	☑	☑	
	Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress;	☑	☑	
	The minimum distance between inner and outer curves is 6m;	☑	☑	
	The crossfall is not more than 10 degrees;	☑	☑	
	Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads.	☑	☑	

3.3 Water supplies

Table 3-3 outlines the proposed performance solution and compliance with the performance criteria for water supply.

Table 3-3 – Performance criteria for water supplies (PBP 2019 guidelines pg. 67)

Performance criteria	Project Solution	Compliance		Comment
		Acceptable solution proposed	Performance criteria proposed	
Adequate water supply is provided for firefighting purposes.	Reticulated water is to be provided to the development, from significantly large insitu water tanks.	☑	☑	There is a proposed reticulated water system powered by a diesel and electric pump system; which will supply the hydrant and sprinkler system. The water storage capacity is to be 1,350m^3. See Figure1-4.
Water supplies are located at regular intervals, and The water supply is accessible and reliable for firefighting operations.	Fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1:2017; Hydrants are not located within any road carriageway;	☑	☑	Design is being finalised and also referenced in the Riskcon (2021) report
Flows and pressure are appropriate.	Fire hydrant flows and pressures comply with the relevant clauses of *AS 2419.1:2005.*	☑	☑	Design is being finalised and also referenced in the *Riskcon* (2021) report
The integrity of the water supply is maintained.	All above-ground water service pipes are metal, including and up to any taps. Above ground water storage tank shall be of concrete or metal	☑	☑	
A static water supply is provided for firefighting purposes in areas where reticulated water is not available.	N/A – reticulated water is provided	N/A	N/A	There is a proposed reticulated water system powered by a diesel and electric pump system; which will supply the hydrant and sprinkler system. The water storage capacity is to be 1,350m^3. See Figure1-4.

3.4 Electricity services

Table 3-4 outlines the proposed performance solution and compliance with the performance criteria for electricity services.

Table 3-4 – Performance criteria for electricity services (PBP 2019 guidelines pg. 68)

Performance criteria	Project Solution	Compliance		Comment
		Acceptable solution proposed	Performance criteria proposed	
Location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings.	Where practicable, electrical transmission lines are underground.	☑	☑	
	Where overhead electrical transmission lines are proposed: Lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and No part of a tree is closer to a power line than the distance set out in ISSC3 Guideline for Managing Vegetation Near Power Lines.	☑	☑	

3.5 Gas services

Table 3-5 outlines the proposed performance solution and compliance with the performance criteria for gas supply.

Table 3-5 – Performance criteria for gas supplies (PBP 2019 Guidelines pg. 68)

Performance criteria	Project Solution	Compliance		Comment
		Acceptable solution proposed	Performance criteria proposed	
Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	Reticulated or bottled gas bottles are to be installed and maintained in accordance with *AS/NZS 1596 (2014)*, the requirements of relevant authorities and metal piping is to be used.	☑	☑	
	All fixed gas cylinders are to be kept clear of flammable materials to a distance of 10m and shielded on the hazard side.	☑	☑	
	Connections to and from gas cylinders are metal.	☑	☑	
	Polymer sheathed flexible gas supply lines are not used.	☑	☑	
	Above ground gas service pipes are metal, including and up to any outlets.	☑	☑	

3.6 Construction standards

The *NCC* does not provide any bushfire specific requirements for buildings of Class 5-8 and as such AS 3959 and the NASH Standard are not considered as a set of Deemed to Satisfy provisions. Compliance with AS3959 and the NASH Standard should, however, be considered when meeting the aims and objectives of *PBP 2019.* Bushfire construction recommendations are dependent on the level of bushfire risk and the provision of adequate access opportunities.

Table 3-6 outlines the proposed performance solution and compliance with the performance criteria for construction standards.

Table 3-6 – Performance criteria for construction standards (PBP 2019 Guidelines pg. 68)

Performance criteria	***Project Solution***	***Compliance***		***Comment***
		Acceptable solution proposed	***Performance criteria proposed***	
The proposed building can withstand bush fire attack in the form of embers, radiant heat and flame contact.	BAL has been determined in accordance with Table A1.12.5 of PBP 2019; and construction provided in accordance with the NCC and as modified by section 7.5 of *PBP 2019.* As depicted in SCHEDULE 1; • All aspects should be constructed in accordance with Section 5 of *AS3959* (BAL-12.5) as modified by section 7.5 of *PBP 2019* This is in addition to the general fire safety construction provisions and requirements of the NCC.	☑	☑	
Proposed fences and gates are designed to minimise the spread of bush fire.	All fences within 6m of a building or in areas of BAL-29 or greater are to be constructed of non-combustible material. All other fences are to be constructed of hardwood and/or non-combustible material.	☑	☑	

Performance criteria	*Project Solution*	*Compliance*		*Comment*
		Acceptable solution proposed	*Performance criteria proposed*	
Proposed Class 10a buildings are designed to minimise the spread of bush fire.	Class 10a buildings are either located >6m from other buildings (in which case no other bushfire protection measures are required) or, if located within 6m of other buildings, are provided with APZs and constructed to the appropriate BAL.	☑	☑	

3.7 Landscaping

Table 3-7 outlines the proposed performance solution and compliance with the performance criteria for landscaping

Table 3-7 – Performance criteria for construction standards (PBP 2019 Guidelines pg. 68)

Performance criteria	Project Solution	Compliance		Comment
		Acceptable solution proposed	Performance criteria proposed	
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 NSW RFS 'Asset protection zone standards' (see Appendix 1 of this document); a clear area of low-cut lawn or pavement is maintained adjacent to the building/s; fencing is constructed in accordance with section 7.6 of *PBP 2019* (see Table 3-6 above); and trees and shrubs are located so that: • the branches will not overhang the roof; • the tree canopy is not continuous; and • any proposed windbreak is located on the elevation from which fires are likely to approach.	☑	☑	

3.8 Issues specific to buildings of Class 5 to 8 under the NCC

Whilst bush fire is not captured in the NCC for Class 5-8 buildings, a number of objectives are applied under section 8.3.1 of *PBP 2019* in relation to access, water supply and services, and emergency and evacuation planning. Table 3-8 outlines the proposed performance solutions and compliance with the specific objectives for buildings of Class 5-8.

Table 3-8 – Objectives and proposed solutions specific to buildings of Class 5-8 under the NCC

Objective	*Project Solution*	*Compliance*
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.	Access provided in accordance with section 3.2 of this report.	☑
To provide suitable emergency and evacuation (and relocation) arrangements for occupants of the development.	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 AS3745:2010.	Can be made a condition of development consent
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	Services provided in accordance with sections 3.3, 3.4, and 3.5 of this report.	☑
Provide for the storage of hazardous materials away from the hazard wherever possible.	Storage and handling of hazardous materials in accordance with: • AS1940:2017 The storage and handling of flammable and combustible liquids • The recommendations of the preliminary hazards assessment (prepared as part of the EIS for the project) are in accordance with SEPP 33	☑

3.9 Issues specific to 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.

3.9.1 Fire Safety Study by Riskcon Engineering

A Fire Safety Study (FSS) for the facility has been undertaken by *Riskcon Engineering* in June 2022 (*Riskcon*). They advised the development would involve;

- Container handlers will be used to transfer waste from the container storage area into the Waste Bunker, through dedicated access into the Tipping Hall. Containers will unload waste into any one of four waste tipping bays in the Tipping Hall. An additional fifth waste bay will be used for the removal of non-conforming waste from the bunker. The bunker has a capacity of 12,375 m_3. It will be constructed of concrete fire walls and is only accessible through the tipping hall. It is noted that the waste turnover program has been designed to minimise the potential for spontaneous combustion within the fuel bunker.

- Waste will be transferred from the Waste Bunker to the Feed Hopper and Chute by one of two overhead cranes with grapple attachments. The hopper will be monitored by CCTV to ensure operators can manage any non-conforming waste. The waste will be discharged from the feed hopper and chute onto a moving air-cooled grate and into the combustion chamber. Combustion air is supplied from air collected from the waste receival and fuel bunkers. The ARC has been designed to process 47.5 tonnes of waste per hour. The chamber operates at minimum of 850_oC to minimise the formation of Volatile Organic Compounds (VOCs) and Poly Aromatic Hydrocarbons (PAHs) and other undesired products of combustion. In addition, ammonia solution (25% v/v) or Urea will be injected into the combustion chamber to prevent the generation of nitrous oxides (NO_x).

- Flue gases will be passed through a series of heat recovery boilers to generate steam (60 bar, 420_oC) to power a turbine and generate electricity. After passing through the boilers, the flue gas will pass through Flue Gas Treatment (FGT) to remove Volatile Organic Compounds (VOCs) and Poly Aromatic Hydrocarbons (PAHs). Powdered Activated Carbon (PAC) will be added to remove dioxins, furans and heavy metals, and then calcium hydroxide (lime) will be injected to remove hydrogen chloride (HCl) and sulfur oxides (SO_x). Prior to discharge to atmosphere, PAC and lime will be removed from the flue gas stream through a series of bag filters. These Air Pollution Control Residues (APCr) will be stored in an APCr Silo prior to stabilisation and disposal in a landfill monocell on site.

- Incinerator bottom ash (IBA) generated in the combustion chamber will be quenched, then transferred via conveyor to the IBA Area. Ferrous and non-ferrous metals will be removed using an overband magnetic separator and an eddy current separator. The metals will be stored in dedicated bays, then transferred onto trucks for sale. The remaining inert material will be transferred to the IBA Maturation Pad via a conveyor. The IBA will be stored in stockpiles (5 m high) for approximately 2-3 months to ensure the quality of the material, and then it will be disposed in the existing Woodlawn Bioreactor Landfill or reused for daily cover or other beneficial use.

Riskcon advised the following hazardous scenarios have been developed:

- Ignition of waste in the tipping hall / waste bunker hall and bunker fire.
- Ignition of waste in the fuel hopper and chute.
- PAC dust liberation, ignition and explosion (storage silo).
- PAC dust cloud explosion within residue silo.
- Steam turbine fire.
- Diesel tank leak, spill, immediate ignition and pool fire

Riskcon also advised that it is necessary to review the facility against the Fire & Rescue NSW (FRNSW) Fire Safety in Waste Facilities Guidelines (Ref. [1]), to ensure the facility is designed with the appropriate fire protection. They undertook a detailed review of the guidelines has been carried out in their Appendix C and was summarised in their Table 9-1.

Riskcon summarised that their analysis identified several fire scenarios which may result in substantial radiant heat impacts which may render fire protection systems inoperable. Where fire protection systems may be affected by fire scenarios recommendations were made regarding the location of installed fire protection. Based on analysis, they concluded that 'should the protection systems be located per the recommendations of their report, the services should be capable of combating the modelled fire scenarios'.

3.9.2 Preliminary Hazard Analysis

Sherpa Consulting undertook a preliminary hazard analysis of the proposed development and prepared their report dated July 2022.

1. They conducted an assessment to determine whether the proposed ARC is 'potentially hazardous' within the guidelines of NSW State Environmental Planning Policy No.33 Hazardous and Offensive Development (*Applying SEPP 33*, Ref [1]) hence whether a Preliminary Hazard Analysis (PHA) is required;

And, if required,

2. Conduct a PHA in line with the *Hazardous Industry Planning and Advisory Paper No 6 – Hazard Analysis* (HIPAP 6, Ref [2]) based on the SEPP 33 screening results as well as any incidents arising from ARC operation with potential offsite land use safety impact for inclusion in the EIS.

Sherpa Consulting concluded that Offsite effects due to fire or explosion involving Dangerous Goods Class 4.2 materials and hazardous scenarios associated with the ARC operations were considered unlikely. Consequence assessment confirmed that the acute safety impacts would be localised and contained on site. This was due to proposed design measures and that these areas are well separated from the site boundary. It is therefore very unlikely that an accident event involving hazardous materials would have any effect that could extend offsite.

This PHA was classified as a Level 1 study with reference to the Multi-Level Risk Assessment guideline (Ref [4] of their report). Comparison of safety effects to surrounding land uses or environmental effects to surrounding ecosystems due to accident events indicated that all HIPAP 4 qualitative risk criteria are met by the proposed development, hence the offsite risk can be considered low.

The Preliminary Hazard Analysis (PHA) recommends that to ensure the assumptions made in the hazard analysis remains valid;

- [PHA 1] That the final layout and design for the ARC facilities meet the safety and separation distance requirements of AS 5026: The storage and handling of Class 4 dangerous goods, AS 1940: The storage and handling of flammable and combustible liquids, and AS 3780: The storage and handling of corrosive substances.

In addition, the following recommendations are provided for Veolia to consider in the detailed design phase:

- [PHA 2] Confirm there is a sufficient number and redundancy of remote emergency isolation and shutdown stations in the boiler and flue gas treatment area.

Table 3-9 outlines the proposed performance solutions and compliance with the specific objectives for hazardous industry and advice proffered by Riskcon.

Table 3-9 – Objectives and proposed solutions specific to hazardous industry

Objective	*Solution*	*Compliance*
Must address the appropriate protection measures to be provided commensurate with the bush fire hazards and associated risks.	Implement the recommendations of *Riskcon* 2021 and *Sherpa Consulting* (2021) along with recommendations provided herein for bushfire protection.	☑
Care should also be taken to ensure that such facilities do not impact on existing developments.	Provision of access, water, electricity and gas supply in accordance in accordance with sections 3.2 , 3.3, 3.4 and 3.5 of this report.	

4. CONCLUSION & RECOMMENDATIONS

4.1 Conclusion

This assessment has found that bushfire may affect the proposed development, with potential exposure to radiant heat and ember attack from existing woodland vegetation to the north-east and the proposed revegetation areas to the south-east and south-west.

In recognition of the bushfire risk posed to the site by nearby bushland, *Travers bushfire & ecology* propose the following combination of bushfire measures, in addition to those measures already required to be implemented due to the generally hazardous nature of the development;

- Building construction for all aspects in accordance with the requirements for BAL-12.5,
- APZs for all Class 5-8 buildings commensurate with the above construction standards, as determined in accordance with Table A1.12.2 of *PBP 2019*,
- Provision of access, water, electricity and gas supply in accordance with the acceptable solutions for residential infill development outlined in *PBP 2019,* and
- Preparation of a Bush Fire Emergency Management and Evacuation Plan

The following recommendations are provided to ensure that the development is in accordance with, or greater than, the requirements of *PBP 2019.*

4.2 Recommendations

Recommendation 1 - The development is as generally indicated on the attached SCHEDULE 1 - Plan of Bushfire Protection Measures.

Recommendation 2 - APZs are to be provided to the proposed development in accordance with Table 3.1 of this report, as generally depicted within SCHEDULE 1 and maintained in perpetuity in accordance with Table 3.7 of this report, Appendix 1 of this document and *Standards for Asset Protection Zones* (NSW RFS, 2005).

Recommendation 3 - Access is provided in accordance with section 3.2 of this report.

Recommendation 4 - Water, electricity and gas supply is provided in accordance with sections 3.3, 3.4 and 3.5 of this report.

Recommendation 5 - Buildings are to be constructed in accordance with Table 3.6 of this report and the requirements of *AS3959 Construction of buildings in bushfire prone areas (2018)* and *Planning for Bush Fire Protection 2019* for all aspects in accordance with the requirements for BAL-12.5. This is in addition to the general fire safety construction provisions and other requirements of the NCC.

Recommendation 6 – A Bush Fire Emergency Management and Evacuation Plan should be prepared consistent with the NSW RFS publication: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan*, and AS3745:2010.

5. REFERENCES

Australian Building Codes Board (2022) – *Building Code of Australia*, Class 1 and Class 10 Buildings Housing Provisions Volume 2.

Chan, K.W. (2001) – *The suitability of the use of various treated timbers for building constructions in bushfire prone areas*. Warrington Fire Research.

Councils of Standards Australia AS3959 (2018) – *Australian Standard Construction of buildings in bush fire-prone areas.*

EMM Consulting (2022) – *Preliminary Hazard Analysis* - Woodlawn Advanced Energy Recovery Centre, Collector Rd Tarago.

NSW Department of Planning (2011) *Hazardous and Offensive Development Application Guidelines - Applying SEPP 33.* State of New South Wales through the Department of Planning

Keith, David (2004) – *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. The Department of Environment and Climate Change.

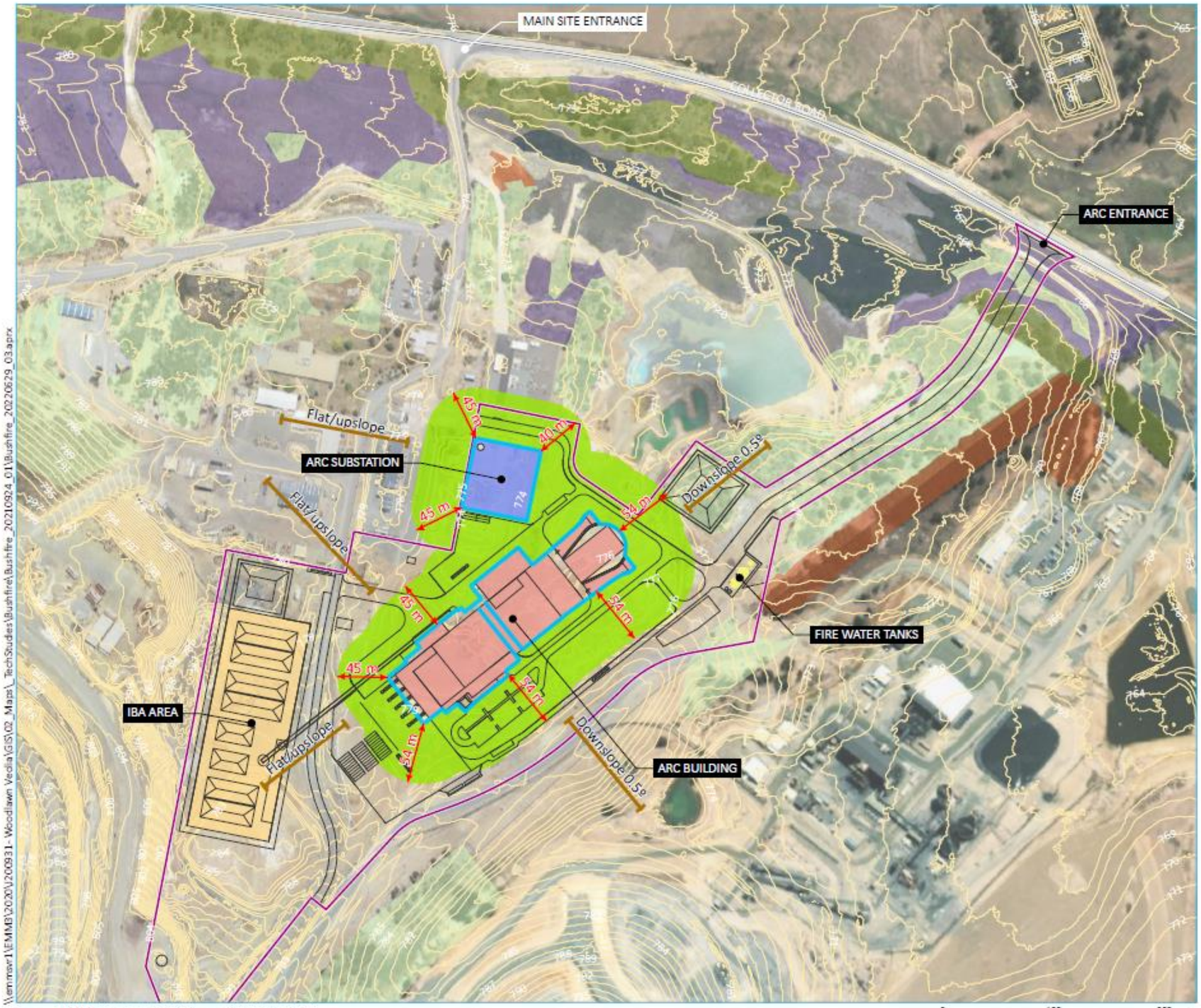
Riskcon (2022) – Fire Safety Study, Woodlawn Advanced Energy Recovery Centre, Collector Rd Tarago.

Rural Fire Service (2019) - *Planning for bushfire protection – a guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service.

Rural Fire Service, *standards for asset protection zones.* NSW Rural Fire Service.

Tan, B., Midgley, S., Douglas, G. and Short (2004) - *A methodology for assessing bushfire attack.* NSW RFS Development Control Service.

SCHEDULE 1. PLAN OF BUSHFIRE PROTECTION MEASURES



KEY

- Development footprint
- Site layout detail
- Major road
- Contour 1 m
- ARC building
- ARC substation
- Fire water tanks
- IBA area
- Asset Protection Zone (APZ)

Bushfire construction standards AS3959(2018)*

- BAL-12.5

Plant community type (PCT) mapping (EMM 2021)

PCT 1191 | Snow Gum- Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion

- Native planted
- Exotic planted
- Regrowth
- Derived native grassland
- Exotic derived native grassland

PCT 1256 | Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion

- Moderate
- Poor

Other

- Waterbody

* Please refer to additional construction requirements for BAL levels which are contained in 'Planning for Bushfire Protection' (2019).

Bushfire protection measures

Woodlawn Advanced Energy Recovery Centre
Bushfire protection assessment
Schedule 1

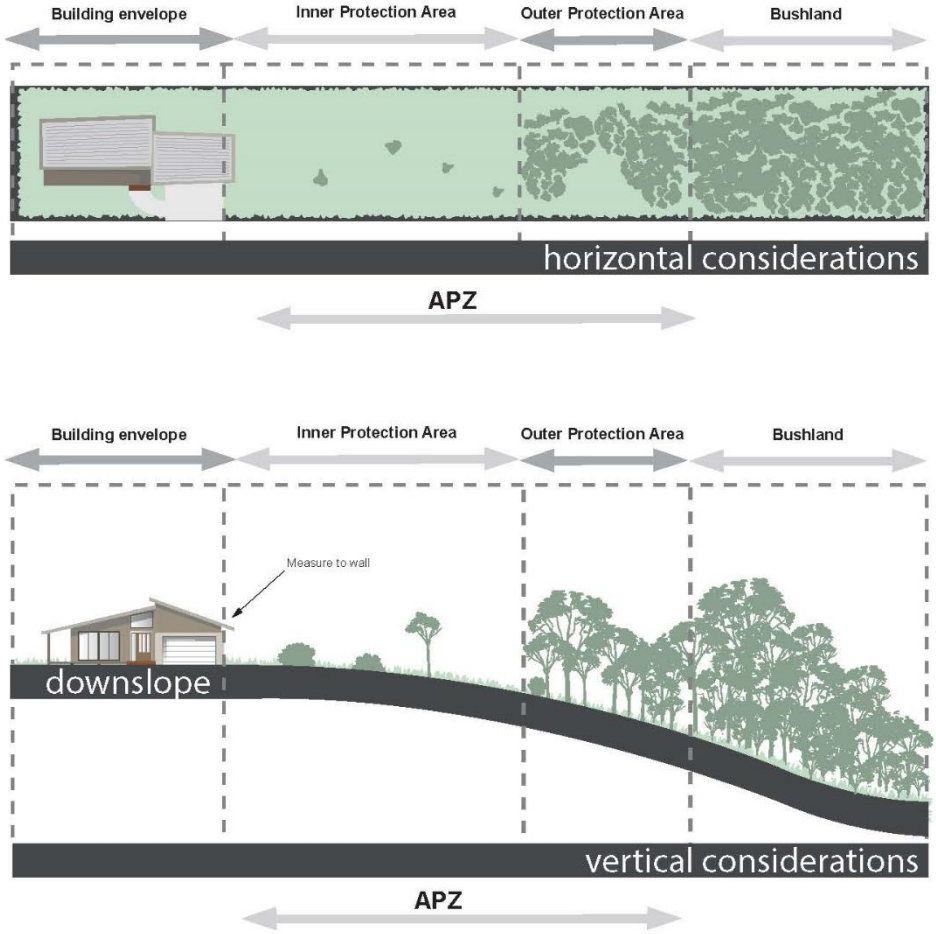
creating opportunities

APPENDIX 1. MANAGEMENT OF ASSET PROTECTION ZONES

The NSW RFS provides basic advice in respect of managing APZs through documents such as, *Standards for Asset Protection Zones* (NSW RFS, 2005), with landscaping to comply with Appendix 4 of *PBP 2019*.

In forest vegetation an APZ may consist of two subordinate areas, an inner protection area (IPA) and an outer protection area (OPA). The IPA is the area immediately surrounding the building and the OPA (up to 30% of the total APZ width) is between the IPA and the hazard.

A typical APZ is graphically represented below.



APZs and progressive reduction in fuel loads
(Source: PBP, 2019)

> **Note:** Vegetation management as shown is for illustrative purposes only. Specific advice is to be sought regarding vegetation removal and retention from a qualified and experienced expert to ensure APZs comply with the NSW RFS performance criteria.

The following table adapted from *PBP 2019* provides maintenance advice for vegetation within the IPA and OPA. The APZ is to be maintained in perpetuity and maintenance should be undertaken regularly, particularly in advance of the bushfire season.

	Inner Protection Area	Outer Protection Area
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 **2m above the ground**; ➢ Tree canopies should be separated by **2 to 5m**; and ➢ Preference should be given to retaining smooth barked and evergreen trees.	➢ Tree canopy cover should be **less than 30%;** and ➢ Canopies should be separated by **2 to 5m**.
Shrubs	➢ Large discontinuities or gaps in the vegetation should be provided to slow down or break the progress of fire towards buildings; ➢ Shrubs should not be located under trees; ➢ Shrubs should form **less 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.	➢ Shrubs should not form a continuous canopy; and ➢ Shrubs should **form less than 20%** of ground cover.
Grass and Leaf Litter	➢ Grass should be kept mown to a height of **less than 100mm**; and ➢ Leaves and other debris should be removed	➢ Grass should be kept mown to a height of **less than 100mm**; and ➢ Leaf and other debris should be removed.

	All Management Zones
Weeds	➢ All weeds should be removed in accordance with best practice guidelines, and measures taken to prevent their further spread
Landscaping	➢ Suitable impervious areas being provided immediately surrounding the building such as courtyards, paths and driveways; ➢ Restrict planting in the immediate vicinity of the building which may over time and if not properly maintained come into contact with the building; ➢ When considering landscape species consideration needs to be given to estimated size of the plant at maturity; ➢ Avoid species with rough fibrous bark, or which retain/shed bark in long strips or retain dead material in their canopies; ➢ Use smooth bark species of trees species which generally do not carry a fire up the bark into the crown; ➢ Avoid planting of deciduous species that may increase fuel at surface / ground level (i.e. leaf litter); ➢ Avoid climbing species to walls and pergolas; ➢ Locate combustible materials such as woodchips / mulch, flammable fuel stores away from the building; ➢ Locate combustible structures such as garden sheds, pergolas and materials such timber garden furniture way from the building; and ➢ Use of low flammability vegetation species.

APPENDIX 2. BUSHFIRE ATTACK LEVEL

TABLE 3.1

BUSHFIRE ATTACK LEVELS AND CORRESPONDING SECTIONS FOR SPECIFIC CONSTRUCTION REQUIREMENTS

Bushfire Attack Level (BAL)	Classified vegetation within 100 m of the site and heat flux exposure thresholds	Description of predicted bushfire attack and levels of exposure	Construction Section
BAL—LOW	See Clause 2.2.3.2	There is insufficient risk to warrant specific construction requirements	4
BAL—12.5	≤12.5 kW/m^2	Ember attack	3 and 5
BAL—19	>12.5 kW/m^2 ≤19 kW/m^2	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux	3 and 6
BAL—29	>19 kW/m^2 ≤29 kW/m^2	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux	3 and 7
BAL—40	>29 kW/m^2 ≤40 kW/m^2	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux with the increased likelihood of direct contact with flames	3 and 8
BAL—FZ	>40 kW/m^2	Direct exposure to flames from fire front in addition to heat flux and ember attack	3 and 9