White Rock Urban Development
Bushfire Management Plan for the Conservation Area

Intrapac Property Pty Ltd

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Template 2.8.1

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Abbreviations

Abbreviation	Description
BMP	Bushfire Management Plan
CAMP	Conservation Area Management Plan
ELA	Eco Logical Australia
FDI	Fire Danger Index
FFDI	Forest Fire Danger Index
FMB	Fire Management Block
FMZ	Fire Management Zone
GHFF	Grey-headed Flying Fox
ICC	Ipswich City Council
PDA	Priority Development Area
QFES	Queensland Fire and Emergency Services
RE	Regional Ecosystem
RFS	Rural Fire Service

1. Introduction

1.1 Background

Eco Logical Australia (ELA) was engaged by Intrapac Property Pty (Intrapac) to prepare a Bushfire Management Plan (BMP) for the Conservation Area for the White Rock urban development within the Ripley Valley, Ipswich. This plan also covers two small areas in the north of the site that are excluded from the Conservation Area but included in this plan for completeness. Intrapac are currently progressing approvals for a mixed-use development at White Rock, Queensland. White Rock is located in the Ripley Valley south of the Centenary Highway, 15 km from the Ipswich central business district.

The White Rock urban development includes five subject lots covering a total of 472 ha (**Figure 1**). Three of the subject lots (Lot 2 SP130834, Lot 174 S31238 and Lot 181 S313342) are within the Ripley Valley Priority Development Area (PDA).

The proposed development covers 223 ha and will result in number of end uses, including residential, commercial, industrial, greenspace, recreation/sporting, educational, roads and easements for internal services. Each component of the development is described within the Urban Design Report (Roberts Day 2017).

As the project will result in the permanent clearing of vegetation, it is predicted that significant residual impacts to Koala and Grey-headed Flying Fox (GHFF) will occur. As such, environmental offsets are required as part of environmental approvals process under the *Environmental Offsets Act 2014* (Qld) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth). A Conservation Area Management Plan (CAMP) (ELA, 2019) directly responds to requirements under these acts and associated offset policies.

A key goal of Conservation Area planning is to allow eventual integration into the existing and adjacent White Rock - Spring Mountain Conservation Estate, which is managed by Ipswich City Council (ICC) (**Figure 1**). The estate is zoned as conservation under ICC's planning scheme and is Ipswich's biggest conservation estate with a total area of 2,633 ha. Integration of the proposed Conservation Area into the White Rock - Spring Mountain Conservation Estate will include both physical integration into the boundaries of the estate and alignment of some of the management outcomes of the estate, whilst maintaining the focus on providing a koala and GHFF offset into perpetuity. As such, this BMP has been developed to align with the existing Ipswich Fire Management Strategic Plan (GHD 2017) to allow for future integration.

1.2 Purpose and objective

The purpose of this BMP is to guide bushfire risk management within the Conservation Area in compliance with the relevant land management and bushfire protection planning legislation. The overriding objectives are associated with the protection of biodiversity values, life and property to support the outcomes of the CAMP and offset obligations. The objective of ICC's Natural Area Estate Fire Management Policy (Document No. A4619418, reviewed 19 January 2018) has been adopted as the objective for this BMP, being:

'*that* [Council's natural area estate] *will be managed to protect life and property from wildfire while planning, manipulating and utilising fire to maintain or enhance environmental values'*.

The specific objectives of this BMP (which are consistent with ICC's Natural Area Estate Fire Management Policy) are listed below;

a) Protect life, property and the environment

b) Minimise the risk of fire entering or leaving the Conservation Area and impacting upon the Conservation Area or adjoining property

c) Maintain ecologically appropriate fire frequencies, distribution, seasonality and intensity

d) Ensure the long term viability and survival of populations of native plants and wildlife

e) Ensure cultural heritage and historic values within and around the Conservation Area are protected

f) Minimise social impacts and hazards associated with smoke.

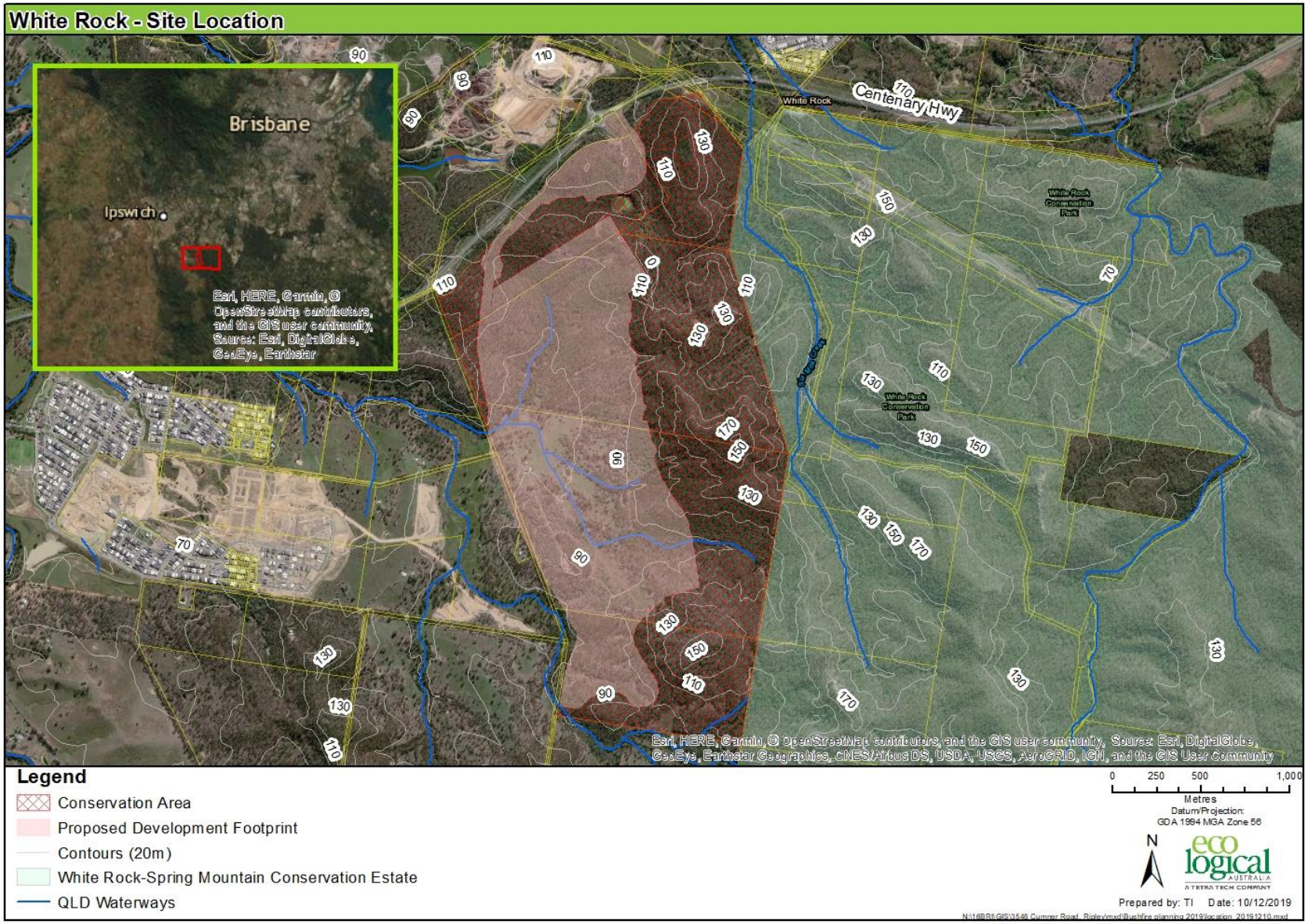

Figure 1: Location

2. Bushfire threat context

2.1 Vegetation communities

ELA (2018) identified vegetation communities within the project area through desktop searches and field surveys. No EPBC Act listed Threatened Ecological Communities exist in the study area (ELA 2018). The communities, as shown in **Figure 2**, include:

- White Mahogany, Grey Gum, Spotted Gum (RE 12.10-9.17)
- Spotted Gum, Ironbark, other Eucalypts (RE 12.9-10.2)
- Forest Red Gum, Swamp Box, Ironbark (RE 12.9-10.7a)
- Forest Red Gum on alluvium (RE 12.3.3)
- Narrowleaved ironbark, Red Gum, Silverleaved Ironbark (RE 12.8.17)
- Spotted Gum (RE 12.8.24)
- Cleared areas (with exotic grassland, *Acacia* and sparse Eucalypts).

The site is dominated by *Corymbia citriodora* (Spotted Gum) forest and woodland on sandstone slopes, which is predominantly in the east of the study area. There is also a large area of *Eucalyptus acmenoides* (White Mahogany), *Eucalyptus major* (Grey Gum) and Spotted Gum Forest in the north of the site. To the south of this vegetation community is a large area of *Eucalyptus tereticornis* (Forest Red Gum), *Lophostemon suaveolens* (Swamp Box) and *Eucalyptus crebra* (Narrow-leaved Ironbark), which exists on lower slopes (ELA 2018).

Introduced pasture grasses are evident across this reserve with lantana (*Lantana camara* and *Lantana montevidensis*) the most prevalent weed species.

2.2 Slope

The site is highly variable in elevations across the Conservation Area, ranging from flat plains to areas greater than 20 degrees. Slope is an important variable in fire rate of spread, fuel consumption and potential fire intensity. Therefore any hazard reduction burns will need to carefully consider the slopes of the blocks in the preparation of the prescribed burn plans.

2.3 Fire weather and fire history

Dry westerly winds are the predominant winds causing the most dangerous fire weather events ion South-east Queensland, with nine out of ten fire events occurring as a result of westerly winds (BOM 2019).

Only one fire has been recorded within the Conservation Area since 2010, with a wildfire occurring on the eastern side of the Conservation Area and within the adjoining ICC White Rock Conservation Estate, however a number of larger fires have occurred adjacent to the Conservation Area since 2010 (**Figure 3**). Minimal evidence of fire history was observed during the site inspection, with no noticeable recent fire scaring observed across the site and limited occurrences of older fire scaring of trees observed.

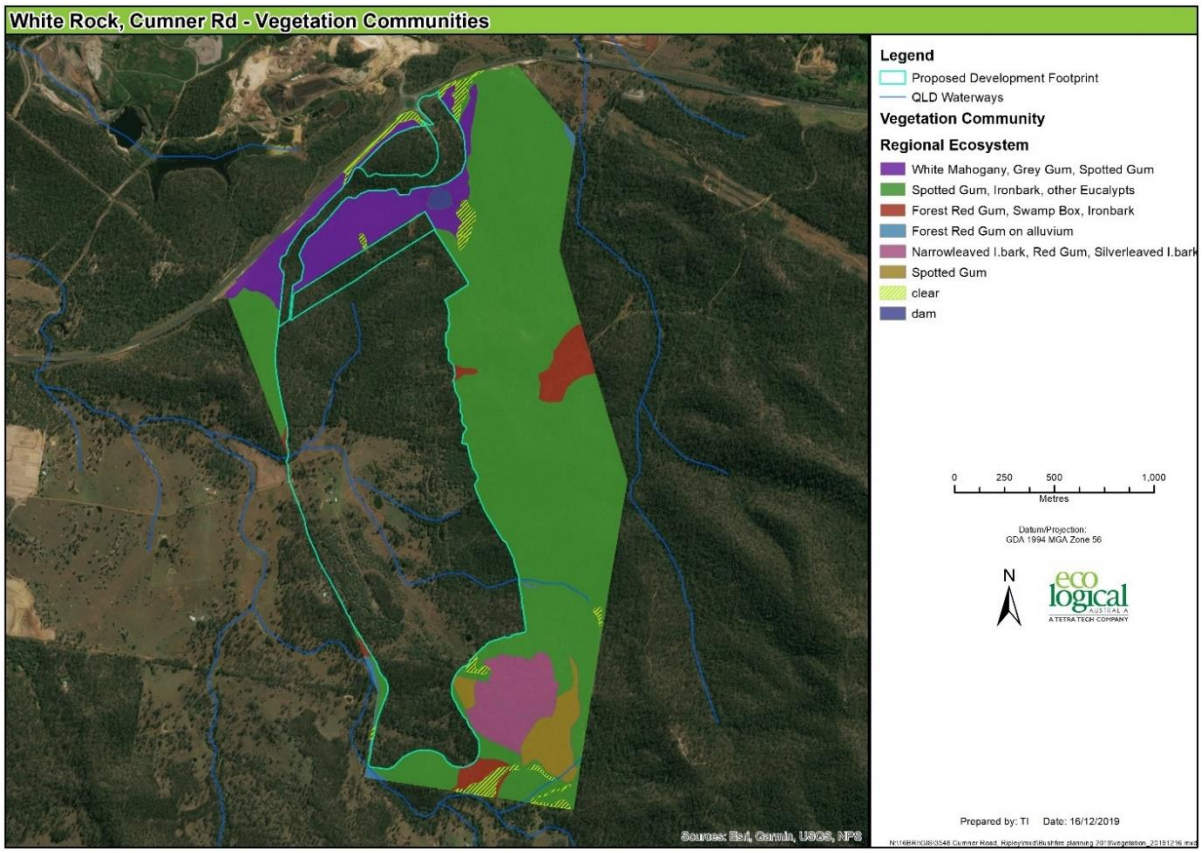

Figure 2. Vegetation Communities

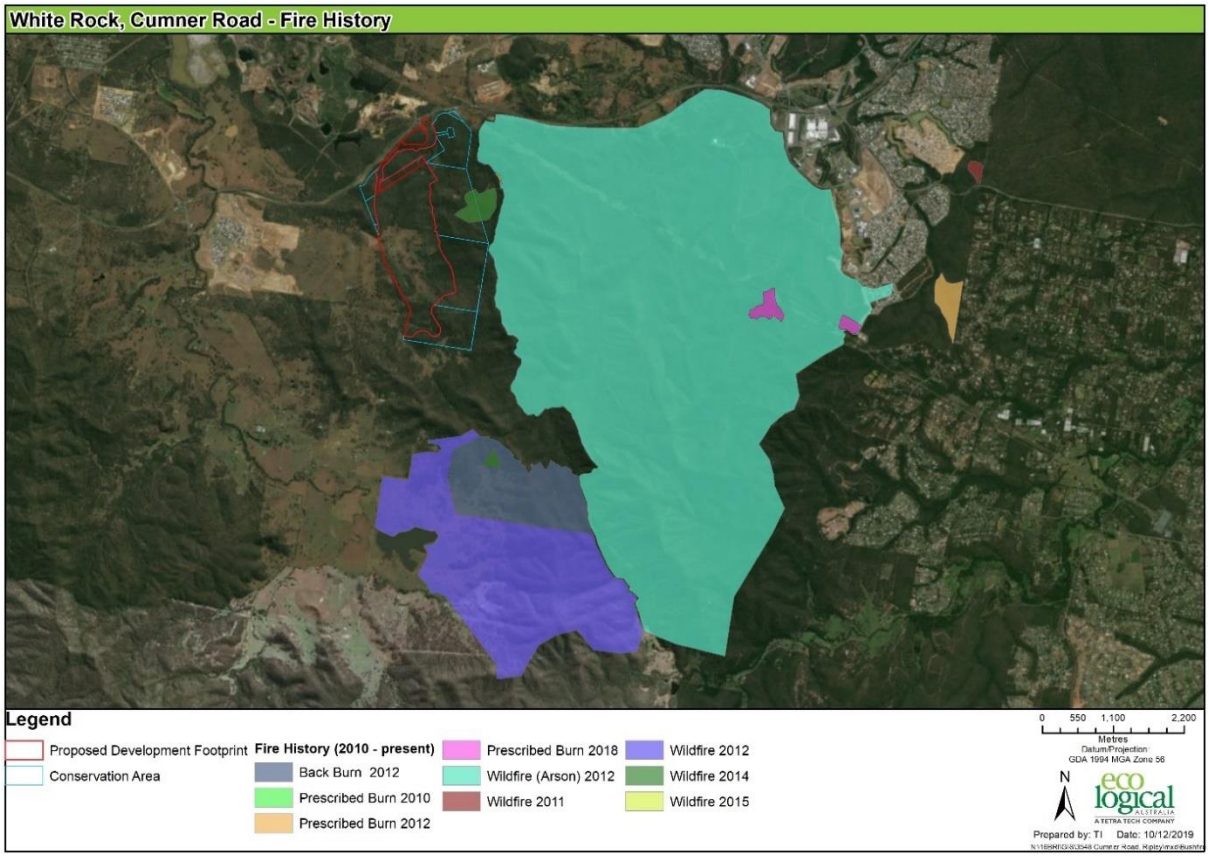

Figure 3. Documented fire history for the Conservation Area and adjoining land

2.4 Fuel hazard

The fuel hazard of each site has been assessed using 'Overall Fuel Hazard Assessment (OFHA) Guide 2010' (Hines *et al.,* 2010). The guide allows for a rapid, visual assessment of fuel arrangement to gain an understanding of how this will affect the chances of controlling a bush fire. The hazard rating given for each layer is done by visual assessment based on ability to see local variations in fuel, with emphasis on how the fuel is arranged.

This assessment is based on assessing key structural layers of the fine fuel complex. Fine fuels contribute to a fires rate of spread and flame height due to the ability to burn in the continuous flaming zone at the fires edge. The arrangement of these fine fuels significantly affects fire behaviour and gives a better indication of potential fire behaviour and suppression difficulty than fuel load alone. An assessment of fuel arrangement can be used for a range of fire management purposes including predicting potential risk to assets to determine radiant heat loads, ember attack and defensible space and the degree of fuel management activities.

There are four layers in the vegetation profile assessed as part of the fuel hazard:

- Bark Fuel: From ground level to canopy, the extent of bark on tree trunks and branches.
- Elevated Fuel: Mainly upright plant material, close to the top of this layer, with a clear gap between surface fuels, containing suspended leaves and bark.
- Near-Surface Fuel: Live and dead fuel in touch with the ground, located in a horizontal and vertical orientation with a range in coverage.
- Surface Fuel: Leaves, twigs, bark and other fine fuel lying on the ground.

Course fuels including logs are not considered in this assessment.

Hazard ratings are assessed in classes of Low, Moderate, High, Very High and Extreme. A rating is given for each of the four layers. The Overall Hazard Fuel = (sum of the influences of) Bark Hazard + Elevated Fine Fuel Hazard + Combined Surface and Near-surface Fine Fuel Hazard. The Indicative fuel load in t/ha is calculated based on the combined fuel hazard rating of each layer.

A summary of the results of the OFHA are provided in Table 1 with locations of the OFHA indicated in Figure 4.

Table 1: Overall Fuel Hazard Assessment for Conservation Area

Site	Bark Fuel	Elevated Fuel	Near Surface Fuel	Surface Fuel	Combined Surface & Near Surface	Overall Fuel Hazard	Indicative Fuel Load
1	L	M	H	VH	E	H	21 - 27 t/ha
2	L	M	H	E	E	H	21 - 27 t/ha
3	L	H	VH	E	E	VH	23 – 30+ t/ha
4	L	M	L	E	E	H	19 - 25 t/ha
5	L	M	L	VH	VH	H	14 - 24 t/ha
6	L	M	M	E	E	H	19 - 25 t/ha
7	L	M	VH	H	VH	H	17 - 28 t/ha
8	L	M	VH	H	VH	H	17 - 28 t/ha
9	L	L	L	L	L	L	3 - 7 t/ha
10	L	L	VH	L	H	M	12 - 21 t/ha
11	L	L	L	L	H	M	14 - 23 t/ha
12	L	H	VH	L	H	H	14 - 23 t/ha
13	L	L	M	M	M	M	6 - 14 t/ha
14	L	L	M	L	L	L	4 – 8 t/ha
15	L	M	H	M	H	M	12 – 20 t/ha
16	L	H	VH	M	VH	VH	19 – 30 t/ha
17	L	H	VH	M	VH	VH	19 – 30 t/ha
18	L	H	VH	L	H	H	15 – 24 t/ha

L = Low; M = Moderate; H = High; VH = Very high; E = Extreme

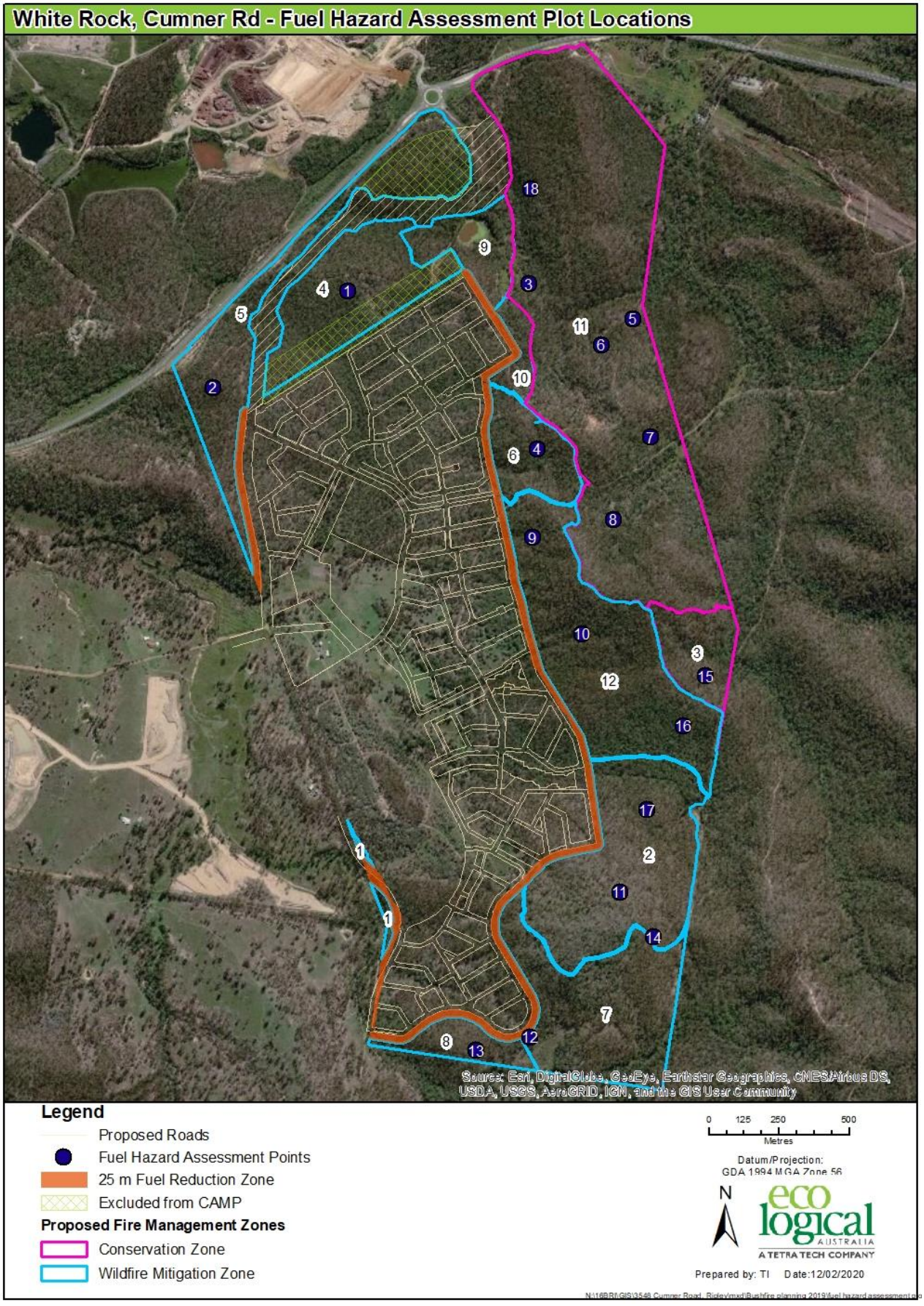

Figure 4. Overall Fuel Hazard Assessment plot locations

2.5 Potential fire behaviour

Bushfire intensity prediction has been used to review potential bushfire runs from various directions with the potential head fire intensity modelled using fire intensity formulae of McArthur (1967). Predicted fire intensity can also be used to better understand the bushfire risk profile of the site in combination with other risk assessment tools such as proximity to refuges, fire catchments, bushfire frequency/likelihood, ignition potential, suppression capacity and impact and damage potential.

The fire intensity model has the following inputs:

- Slope (in degrees)
- Vegetation classified into groups and predicted fuel loads (t/ha) based upon maximum fuel loads
- Fire weather represented by a Fire Danger Index (FDI) of 57, determined using the CSIRO State-wide methodology (Leonard *et al* 2014)
- A direction of fire spread under the FDI 57 for all wind directions.

Figure 5 may be used as a surrogate for bushfire risk with the higher fire intensity localities representing areas where fire control may be more difficult or dangerous and where impacts may be greater. It is emphasised, however, that the site has the potential to carry fire in any year at intensities well beyond the controllability of fire-fighters. The bushfire management actions and activities identified in Section 4 aim to mitigate this risk where possible.

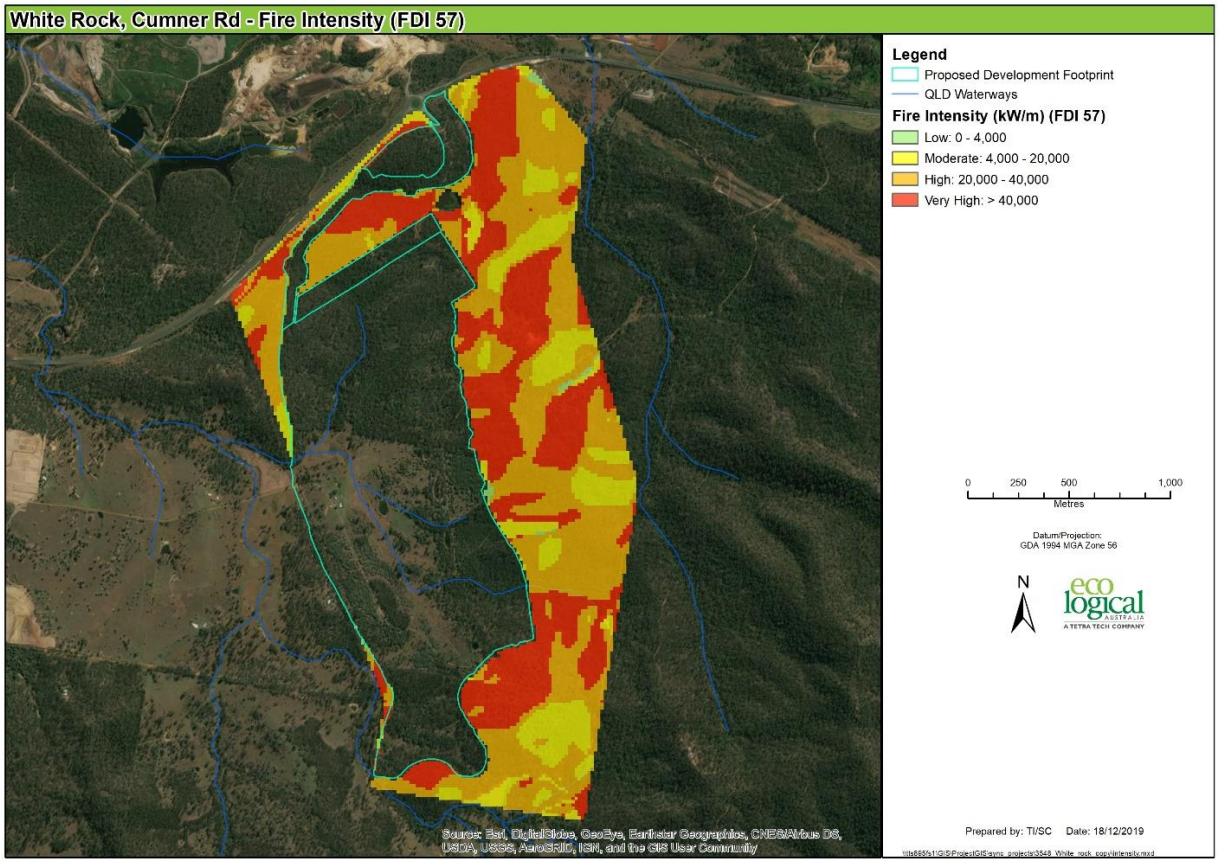

Figure 5. Modelled potential Fire Intensity for Conservation Area

2.6 Climate change

The CSIRO (2018) state that there has been a long-term increase in extreme fire weather and in the length of the fire season across large parts of Australia since the 1950s, with eight of Australia's top ten warmest years on record occurring since 2005. The annual 90th percentile of daily Forest Fire Danger Index (FFDI) (i.e., the most extreme 10 per cent of fire weather days) has increased in recent decades across many regions of Australia, especially in southern and eastern Australia (**Figure 6**).

There is also a trend in some regions towards an increasing number of days when high fire danger ratings are combined with conditions that allow bushfires to generate their own weather systems, including thunderstorms with dry lightning. This can lead to extremely dangerous fire conditions as observed in the Canberra (2003), Black Saturday (2009) and recent 2019/20 fires in Victoria and NSW, including generating additional fires from lightning strikes (CSIRO 2018).

It is not clear what the effects of climate change will bring for the Conservation Area specifically, however as indicated in the second point above, an increase in the number of days when extreme fire behaviour could occur may significantly increase the risk of bushfire damage (through intensity and extent of wildfire) and pose a greater risk to ecological values as well as adjoining property through a greater risk of higher intensity bushfire attack.

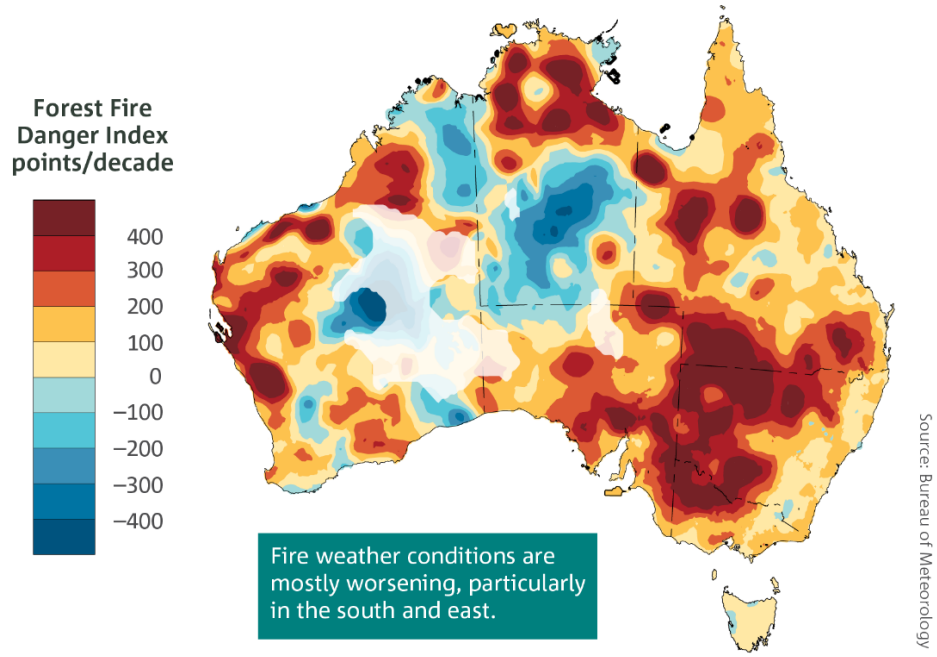

Figure 6. Changes in Forest Fire Danger Index Conditions

2.7 Assets at risk

Unplanned bushfire, bushfire management actions and bushfire suppression activities all have the potential to adversely impact the built, cultural and environmental assets in and around the site. Damage or destruction of these assets may have major economic, social and environmental consequences.

There are a number of assets that are or will be located within the Conservation Area or in close proximity to the boundary, including:

- Urban development (existing and planned future development)
- Centenary Highway
- White Rock – Spring Mountain Conservation Estate
- Recreational facilities
- Transmission lines
- Fire trails and access tracks.

3. Fire Risk Management Framework

The risk management approach used for this project is based on the process defined by Australian Standard (AS) ISO 31000:2018 'Risk management – Guidelines' (Standards Australia 2018), the Ipswich Fire Management Strategic Plan (GHD 2017), and ICC's Natural Area Estate Fire Management Policy (ICC 2018). A flowchart illustrating the process of emergency risk management is included as **Figure 7** below.

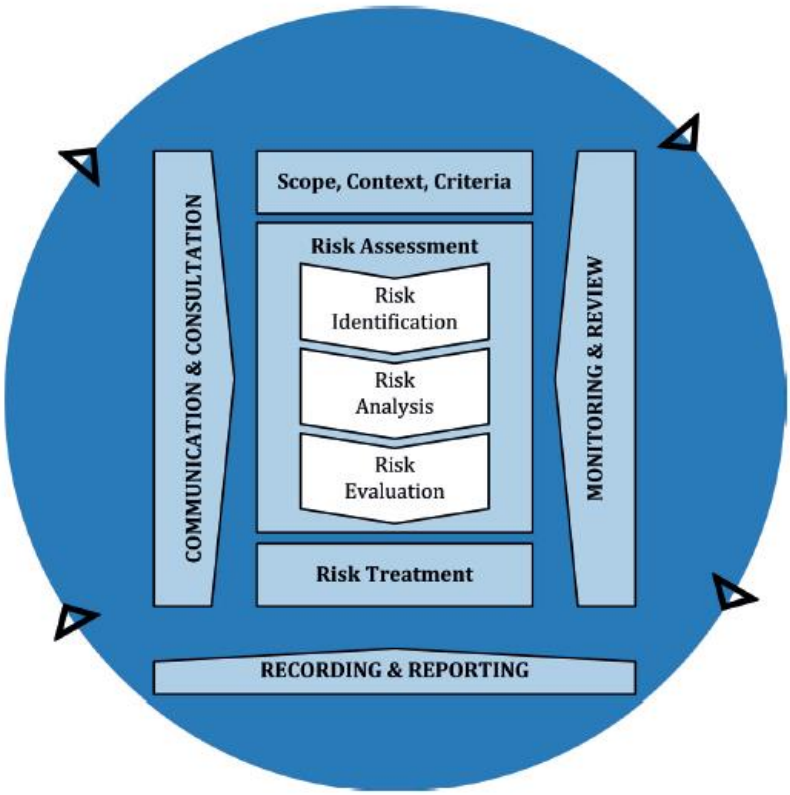

Figure 7: Emergency risk management planning after AS ISO 31000:2018 'Risk management – Guidelines' (Standards Australia 2018)

To align with ICC's Natural Area Estate Fire Management Policy fire risk management approach, a range of strategies and actions for fire risk management in the Conservation Area will include:

- Maintaining a park fire danger schedule for operational response and visitor safety
- Maintaining a close working relationship with Queensland Fire and Emergency Services (QFES) and other disaster management agencies
- Developing and implementing fire management plans for individual reserves
- Developing and maintaining a network of fire trails, fire breaks and fuel reduced areas
- Conducting annual assessments of fire fuel loads
- Implementing measures to reduce risk on Council lands including the use of hazard reduction burns
- Educating park visitors through on ground signage, links to Council's website and other means
- Land use planning.

3.1 Bushfire Vulnerability Analysis

To ensure consistency and synergy with the White Rock – Spring Mountain Fire Management Strategic Plan (GHD 2017), the strategic framework used by GHD (2017) to assess each individual fire management block (FMB) in terms of risk has been applied for the Conservation Area. **Figure 8** shows schematically the methodology applied to complete the vulnerability analysis and prepare the risk dashboard for the Conservation Area. The detailed methodology is provided in Section 3.2 of the Ipswich Fire Management Strategic Plan (GHD 2017), with the vulnerability factors applied detailed in Section 4 of the Ipswich Fire Management Strategic Plan (GHD 2017) and summarised in **Table 2**.

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Table 2: Bushfire vulnerability factors

Risk Factor	Vulnerability Risk Description				
	Very High	High	Moderate	Low	N/A
Ecological asset	FMB contains or directly adjoins a fire sensitive ecological asset which contains a substantial proportion of the overall ecological asset (>25%). The fire sensitive ecological asset is either not tolerant of fire or is highly susceptible (itself or its critical habitat requirements) to altered fire regimes (including high intensity bushfires)	FMB contains or directly adjoins a firesensitive ecological asset which contains a substantial proportion of the overall ecological asset (10-25%). The fire sensitive ecological asset is either not tolerant of fire or is highly susceptible (itself or its critical habitat requirements) to altered fire regimes (including high intensity bushfires)	FMB contains or directly adjoins a firesensitive ecological asset which contains a substantial proportion of the overall ecological asset <10%). The fire sensitive ecological asset is either not tolerant of fire or is highly susceptible (itself or its critical habitatrequirements) to altered fire regimes (including high intensity bushfires)	FMB contains species which are tolerant of altered fire regimes and infrequent low, moderate through to high intensity fire	-
Ecological health	Vegetation has tree crowns with very low levels of dieback<10%, with mostly full crown and little epicormic growth. Clear and open understorey, easy to walk through, minimal or no Lantana. Native grasses are >50% and mostly >80%. Planned fire of low/moderate severity is the key management option to prevent degradation of ecosystem health and limit threatening process.	Vegetation has tree crowns with emergent levels of dieback <25%, with mostly full crown and little epicormic growth. Understorey is comprised of monocultures of high intensity fire generated even aged shrubs, mostly without Lantana. Some native grasses are present, 50% - 80%. Planned fire of low/moderate severity is the key management option to prevent further degradation of ecosystem health and limit threatening process such as bell miner dieback	Vegetation has tree crowns with established levels of dieback >25% or <25% of severe levels of dieback, with crown contraction and moderate epicormic growth (~50% of crown). The healthy grassy understorey has been significantly invaded by shrubs (up to 60% cover), including Lantana, high intensity fire generated monocultures and other weeds (up to 50%). Some native grasses are present 25%-50%. Planned fire of low/moderate severity is still a management option to prevent further degradation of ecosystem health and limit	Vegetation has tree crowns with severe/irreversible levels of dieback, with crown contracted, leaves sparse, dead branches and mostly epicormic growth. Understorey is shrubby (>60% cover), including Lantana and other weeds (>50%). Native grasses are sparse or absent. Planned fire of low/moderate severity is unlikely to be a management option for further prevention of threatening processes such as bell miner dieback	-

Risk Factor	Vulnerability Risk Description				
	Very High	High	Moderate	Low	N/A
			threatening processes such as bell miner dieback		
Fire Severity	40,000+ kW/m potential bushfire intensity	20,000 - 40,000 kW/m potential bushfire intensity	4,000 - 20,000 kW/m potential bushfire intensity	0 – 4,000 kW/m potential bushfire intensity. Potential impact buffer (area adjacent to areas of very high, high and medium Potential) or an area that can support a significant grassfire	An area that is unlikely to support a significant bushfire or grassfire
Bushfire attack level	Direct flame contact, radiant heat and ember attack on residential structure [BAL 40 and Flame Zone]	Radiant heat and ember attack on residential structure [BAL 19 29]	Ember attack on residential structure [BAL12.5]	Potential minor fire (smoke and ember) impacts (100 – 300 m from hazard)	No potential bushfire impacts on residential structures, 300+ m from hazard
Access	Single lane natural surface dead end trail traversing vegetation with no / very few passing bays and turn around points	Single or two laneway dead end sealed or unsealed access traversing vegetation with passing bays and turn around points	Two lane (or greater) sealed access with sporadic vegetation exposure and alternative access routes	Freeway and major road access with significant vegetation separation	Not applicable access constraints do not apply
Housing stock	-	Residential cluster, precinct or subdivision for which development approval was given prior to 2010 (i.e. prior to application of AS3959:2009)	-	Residential cluster, precinct or subdivision for which development approval was given after 2010 (i.e. housing stock constructed to AS3959:2009)	No residential structures located within 100 m of FMB
Fire vulnerability asset and smoke sensitive receptor risk	Fire vulnerable asset directly adjoins FMB with little vegetation separation and a significant potential for direct flame contact, radiant heat,	Fire vulnerable asset, including critical access and egress, is located within 100 m of a reserve and may be susceptible to ember attack and elevated smoke concentrations	Fire vulnerable asset is located within 1 km of the reserve and potentially may experience smoke	Fire vulnerable asset is located more than 1 km from reserve, with only minor smoke impacts possible	-

Risk Factor	Vulnerability Risk Description				
	Very High	High	Moderate	Low	N/A
	ember attack and maximum smoke concentrations				
Surrounding landscape vegetation cover	Land cover dominated by extensive, mature, fire prone vegetation. During drought the local landscape has previously supported large fires. Clearings within the extent of forest are relatively small and easily crossed by short distance spotting (<500 m)	Roughly equal mix of cleared agricultural lands (or urban intermix lands) and remnant vegetation - forested areas are large enough to support running high intensity fire and spread to other forest areas through short distance spotting (< 500 m)	Mostly cleared or urbanised landscape withsmall and/or regularly grazed or burnt forest remnants. Forest areas/linear features not sufficiently large or continuous enough to support large, high intensity fires	Extensively cleared agricultural or urbanised landscape with only isolated clumps or linear features with trees, or a more extensive forest area which has highly modified understorey (such as mown grass, low flammability, reticulated gardens)	-
Fire suppression success	Rough topography with relatively limited access making initial attack by ground crews difficult	Rough topography but with reasonable road/trail access such that fires starting on low to high FDR days are usually contained within 1 -2days	Undulating/hilly topography with reasonably good access fires starting on low to high FDR days are almost always contained by initial attack resources	Gentle topography with good road/trail access and surrounding landscape visibility	-

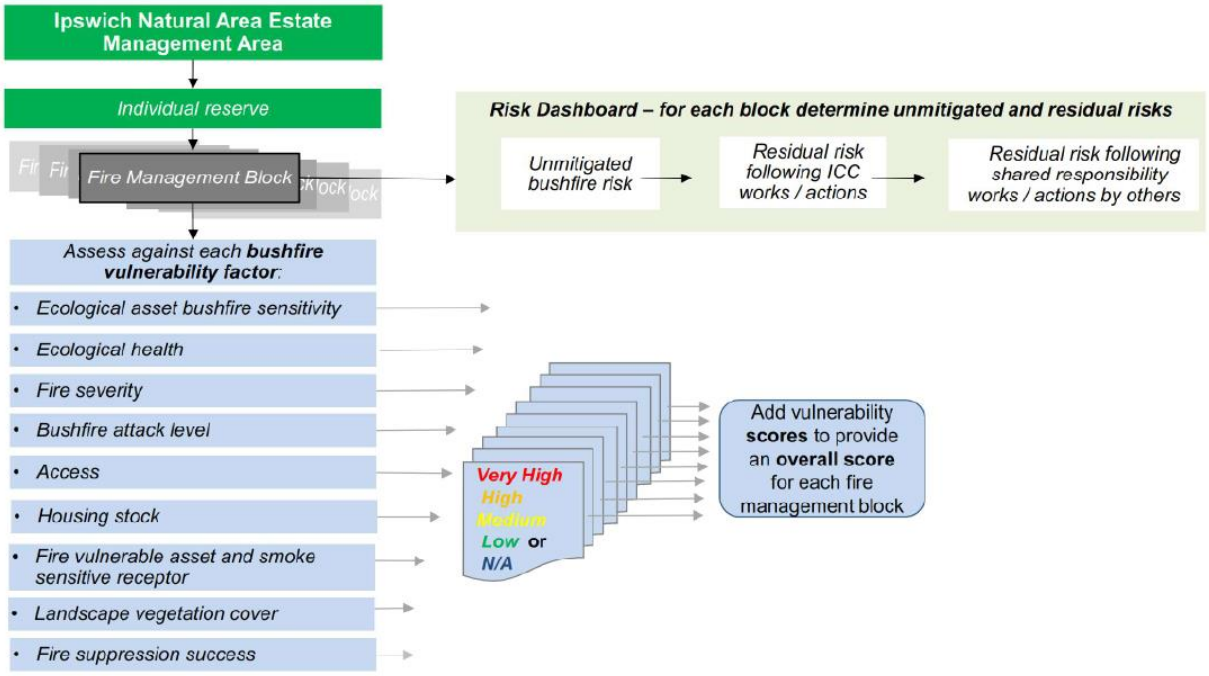

Figure 8. Classification of vulnerability factors and residual risk for fire management blocks (GHD 2017)

3.1.1 Vulnerability factor ratings and rankings

For each Fire Management Block (FMB) within the Conservation Area, a five scale rating class was applied to each vulnerability factor as detailed in **Table 2**. The values for each factor were then added together to provide a total score for the FMB to allow each FMB to be ranked relative to all other FMBs in the Conservation Area. FMBs with higher scores are identified as being potentially the most vulnerable, and therefore a higher priority for mitigation works. The scoring matrix is detailed in **Table 3**.

Table 3: Vulnerability factor rating

Vulnerability risk	Numeric value assigned
Very High	4
High	3
Moderate	2
Low	1
Not applicable	0

3.1.2 Unmitigated and residual risk classification

Separate to the classification of the FMB's vulnerability risks, the residual risk for each block is also assessed, (as also shown in **Figure 8**), in three phases being:

- Unmitigated bushfire risk – if no management mitigation or response actions are taken (unlikely given legal and policy obligations)
- Residual risk following mitigation activities in Conservation Area

- Residual risk after shared responsibility actions are implemented by others – i.e. adjoining landowners and authorities undertaking management actions.

This process results in the classification of Acceptable, Tolerable or Intolerable risk for each category to help prioritise management actions required.

These classes are as referenced in the State Planning Policy (2016b) and defined as follows:

- Acceptable risk: A risk that, following an understanding of the likelihood and consequences, is sufficiently low to require no new treatments or actions to reduce risk further. Individuals and society can live with this risk without feeling the necessity to reduce the risks any further.
- Tolerable risk: A risk that, following an understanding of the likelihood and consequences, is low enough to allow the exposure to continue, and at the same time high enough to require new treatments or actions to reduce risk. Society can live with this risk but believe that as much as is reasonably practical should be done to reduce the risks further.
- Intolerable risk: A risk that, following an understanding of the likelihood and consequences, is so high that it requires actions to avoid or reduce the risk. Individuals and society will not accept this risk and measures are to be put in place to reduce risks to at least a tolerable level.

A risk dashboard collating the findings of the fire risk management framework for the Conservation Area is provided as Appendix A. This sets out the findings, the unmitigated bushfire risk, actions to reduce risk (as discussed in Section 4) and residual risk after actions.

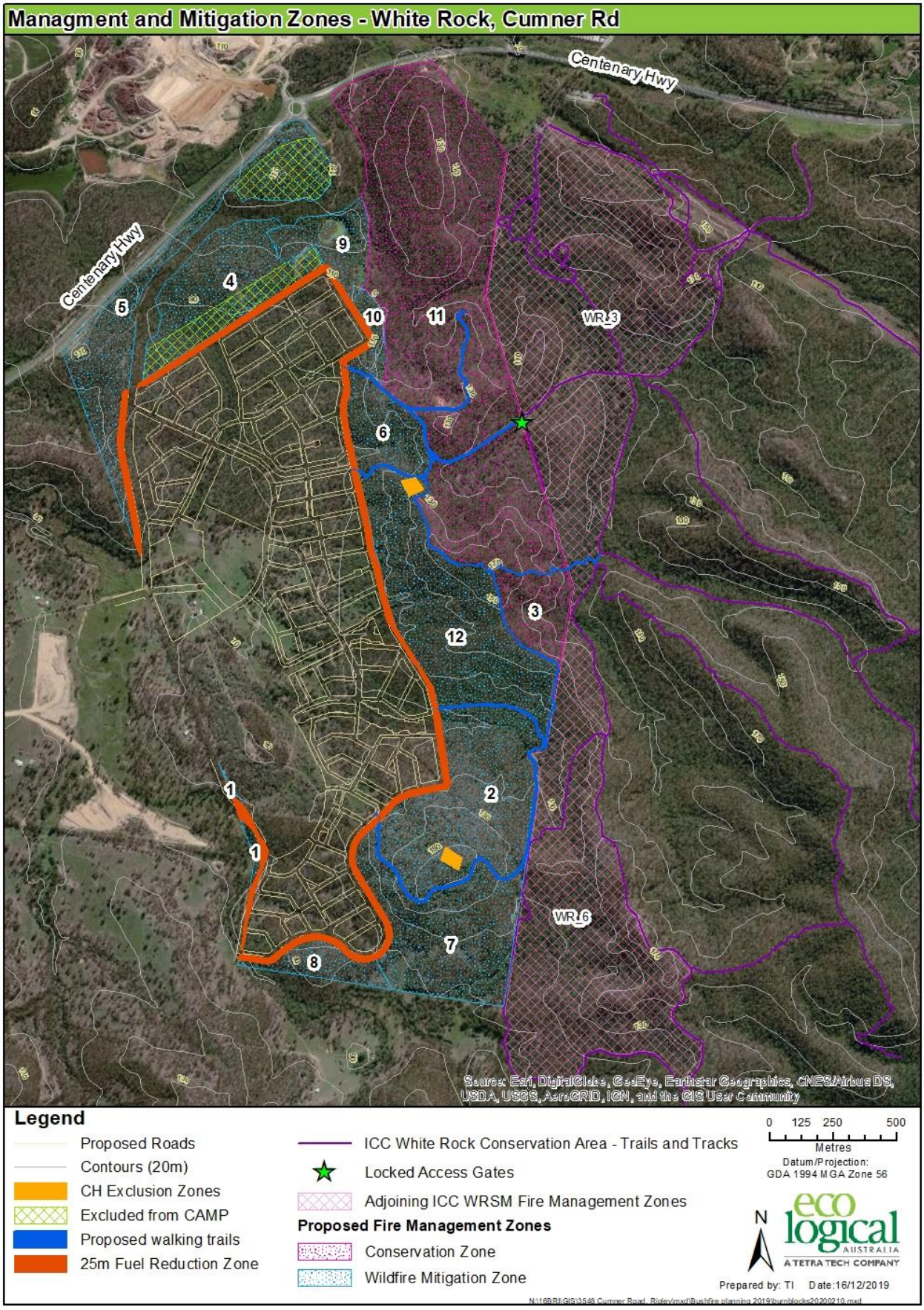

Figure 9. Management and Mitigation Zones for Conservation Area

4. Bushfire Mitigation Actions

The bushfire mitigation works required to reduce the risks identified in previous sections are provided in this section of the BMP. The mitigation works represent best practice but will not eliminate the bushfire risk. Effective preparedness, response and recovery to bushfire will also be essential. The mitigation work priorities should not be changed without expert review of the effects of the change on the BMP objectives. All strategies and actions are interconnected to build an effective outcome; if one is not completed it may significantly reduce the effectiveness of others, some of which may be critical.

4.1 Aims

In general terms, the aims of bushfire mitigation are to be achieved by a combination of the following:

- *Altering site characteristics to facilitate successful fire response* - implementing site works that facilitate fire suppression, reducing the risk of fires being able to develop to large, high consequence fires (see bushfire assets and advantages)
- *Vulnerability reduction* - constructing and/or managing assets in such a way that they are less vulnerable to fire damage
- *Ignition reduction* - managing activities such that unplanned fire ignitions are minimised
- *Hazard modification* - altering the characteristics of bushfire hazards, particularly adjacent to assets or across known or predicted fire paths, so that fires have less damaging characteristics or behaviour.

4.2 Fire Management Zones

Fire Management Blocks (FMBs) have been determined based on the trail and track network within the Conservation area and the adjoining White Rock Conservation Estate. The FMBs are then assigned into Fire management zones (FMZ) (**Figure 9**). FMZs provide a framework within which fire management strategies and actions are developed and implemented. FMZs are based on the location of assets, surrounding land bushfire mitigation measures, topography, land use, potential bushfire hazard and risk. FMZs are distinguished by the following imperatives:

- Fuel reduction/Asset Protection
- Wildfire Mitigation
- Conservation.

Zones have been identified and mapped across the Conservation Area to provide a planning framework upon which the protection of life, property and the environment can be improved. A description of each of these zones and their general management objectives is provided in **Table 4.**

The zones each have different objectives and therefore different actions, however they do not operate in isolation and a range of zones are required to achieve a holistic level of bushfire protection at a landscape scale.

It is the responsibility of the CAMP Environmental Manager to assess ecological thresholds and fuel management requirements. As part of CAMP implementation, an initial assessment of required fire

management activities will be required, followed by implementation of required management measures (such as prescribed burns).

Table 4: Description of bushfire management zones

Zone	Objective	Description	Fuel management strategies
25 m wide Fuel Reduction /Protection Zone	Aims to protect human life, property and highly valued assets and values.	An area immediately surrounding development managed to reduce the bushfire hazard to an acceptable level. Exists within other zones around specific built assets.	The preliminary width of asset protection zones for the adjoining future development subject to a separate assessment (MWH 2017), with the fuel reduced zine enhancing the asset protection zone and providing for a 'soft' interface between the development footprint and the conservation area. Fine fuel in ground and shrub layers are not to exceed low to moderate overall fuel hazard (OFH) (based on Hines et al 2010 – see Section 2.4) or 5 tonnes/ha (based on DNPRSR 2012). Fuel managed by slashing, selective shrub clearing, trail construction. Area treated target is 90%.
Wildfire Mitigation	To provide for strategic containment of wildfires which will reduce the speed and intensity of bushfires and reduce the potential for spot fire development that may result in a deterioration of the ecological values of the zones. They are also used to provide safe access for bushfire operations and to assist with implementing fire management activities.	Usually adjacent to infrastructure (e.g. management trails, roads, walking tracks and cleared boundaries) for the purpose of adding depth to the effectiveness of these features. They can also be located in strategic areas to reduce the spread of wildfire and aid suppression e.g. near known ignition points and narrow vegetated corridors. Until the development of the proposed urban area to the west, these areas can be managed as conservation zones.	Fine fuel in ground and shrub layers should not exceed 8-12 tonnes/ha. Maximum OFH < High or ≤ 8 tonnes/ha of fine fuels in ground and shrub layers - this is commonly used as a level for which the fire intensity expected will not impact on any adjacent developments or assets. Planned burns are completed at lower end of recommended fire frequency (see **Table 6**) to maintain fuels at OFH < High or ≤ 8 tonnes/ha. Fuel management by slashing, selective shrub clearing, trail construction or prescribed burning. Area treated target is 60 – 80% of block.
Conservation	To manage bushfires to meet biodiversity objectives where Fuel reduction/Protection or Wildfire Mitigation Zones are not appropriate or necessary.	Areas primarily managed for conservation, aesthetic, or water catchment purposes. These areas are not adjacent to infrastructure.	Undertake prescribed (ecological) burning programs in accordance with intervals specified in **Table 6** primarily for biodiversity conservation purposes, however the spatial pattern of burning should also provide some fire control advantage where possible

4.3 Standards for mitigation of bushfire hazard

4.3.1 Hazard mitigation

Appropriate management of fuels in strategic locations can reduce bushfire risk to CAMP outcomes. However, this needs to be based upon good science and practical experience e.g. understanding the limits of fuel removal in a prescribed burn and the duration of protection/mitigation achieved by burning in different vegetation types.

The following mitigation works aim to modify/reduce the hazard:

- Fuel reduction/protection zones around assets and locations adjoining the urban development. Requirements are shown within the fire management zones and within the bushfire mitigation works program
- The Bushfire Mitigation Works Schedule defines the maintenance regime required
- Prescribed burning used strategically to improve the success rate of fire suppression and to help lower the bushfire risk at specific locations. Prescribed burning is also an important biodiversity conservation strategy to support the outcomes of the CAMP.

Table 5: Bushfire Mitigation Works Program

Work Type	Location	Fire Management Zone	Standard	Timing	Procedures	Responsibility / Monitoring
Access maintenance	Entire site	All zone types	Free from all obstructions to allow the safe passage of appliances based on ICC Manual (see Section 1.1)	June and July (annually)	Inspect in June and any works completed by end of July (annually), and as required in Fire Danger Period	CAMP Environmental Manager
Hazard mitigation	See Figure 9	Fuel reduction	As per Table 4	Prior to Oct (annually), and as required in Fire Season	Required upon CAMP implementation.	CAMP Environmental Manager, with input from ICC and DES. Prescribed burns undertaken by RFS. See Section 4.6.
Hazard mitigation	See Figure 9	Wildfire mitigation zone	As per Table 4	Prior to June (annually), and as required in Fire Season	Access tracks to be maintained in a fuel free state	As above
Hazard mitigation	See Figure 9	Conservation zone	As per Table 4	Annual	Review of fire history and thresholds to avoid fire regimes beyond fire interval thresholds for native vegetation communities making up the species habitat	As above

Work Type	Location	Fire Management Zone	Standard	Timing	Procedures	Responsibility / Monitoring
Water Supply maintenance	All	All	NA	Prior to July (annually)	Inspect/maintain operability of all Static Water Supply (SWS) including water level, hydrants, valves and connections Ensure signage is installed and visible Clear vegetation around SWS (minimum of 6 m) for ease of access	CAMP Environmental Manager
Plan	Entire site	All zone types	NA	Annual (May)	Review annual Mitigation works program	CAMP Environmental Manager

4.4 Fire trails and access

The fire/bushland trails, as shown in **Figure 10**, have been designed to avoid areas of high biodiversity value and to maximise use of current trails (to avoid additional vegetation clearing). New trails will be micro-sited (by a suitably qualified ecologist) to avoid any areas of high ecological value.

Three main track types will be utilised, including:

- T1: Management vehicle access tracks – 3-5m wide fire trails and overtaking bays approximately every 200 m
- T2: Hiking trails - 3m wide
- T3: Bike trails – 3 m wide.

Once the tracks have been established, they will be formalised in a way sympathetic with the Conservation Area, likely with road base or local material. All trails will require water diversion devices / drains to minimise track erosion.

The fire trail network (T1) should be constructed to ICC standards requiring an all-weather surface and trafficable width of up to 4 m and appropriate turnaround areas. As the majority of the Conservation Area is located on a ridge-line the trails will not need to cross wetlands or other areas subject to frequent inundation. The shallow sandy soils across the site will require minimum soil disturbance and trails will be able to be constructed at grade.

Fire trails will be:

- accessed through lockable slip rails (4.2 m wide) and accessible at all times by fire-fighting vehicles
- connected through to the public road network or network of other fire maintenance trails in the adjoining White Rock – Spring Mountain Conservation Estate
- respond to site topography and bushfire characteristics of the site and surrounding area
- be located, designed and constructed to protect firefighter safety and provide for movement, manoeuvring and access to water supplies for firefighting
- be designed so that dead ends are avoided; however if a dead end is unavoidable, a turnaround of sufficient radius for a full lock by a Category 1 fire tanker should be constructed (radius 12m) and if there is insufficient space for such a turnaround due to the topography, provision should be made to allow a maximum three-point turn (radius 10 m)
- be designed and constructed to avoid adverse environmental impacts, including soil erosion, impacts on natural hydrological flows, or other land degradation
- not alter natural hydrological flows or expose acid sulfate soils
- be maintained to provide safe four-wheel drive access by fire-fighting vehicles.

Formalisation of these trails will also ensure that public access is contained to appropriately managed areas and minimise potential impacts associated within erosion and track widening as well as unregulated public access. The trail network will strategically link with the White Rock-Spring Mountain Conservation Estate to the east.

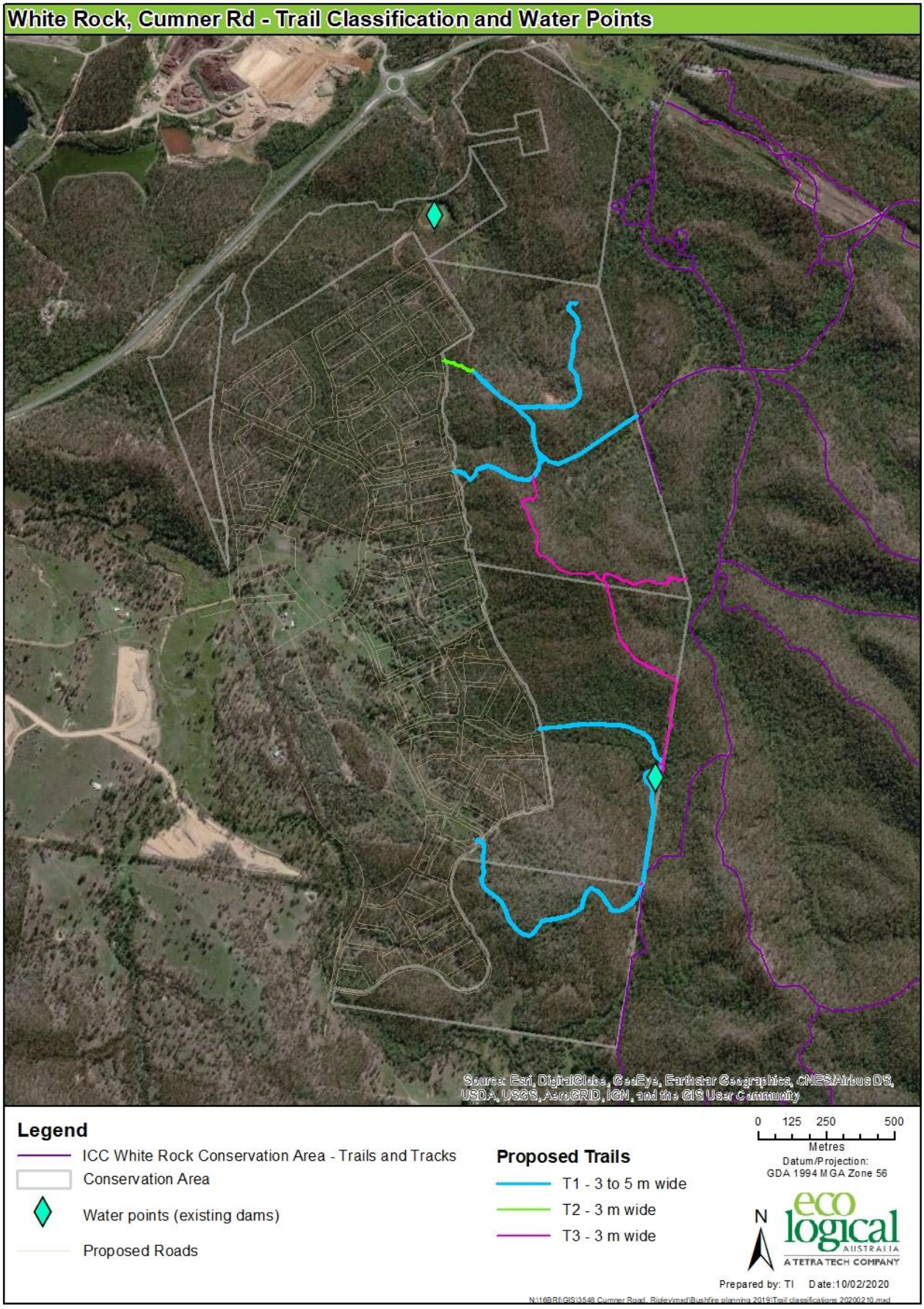

Figure 10. Trail network and water points for Conservation Area

4.5 Water supply

Water supply points suitable for fire fighting operations include both reticulated (hydrants with suitable fittings) and static water supplies (SWS). Static water supplies include water tanks and dams accessible for vehicles and helicopters. There are limited SWS within the Conservation Area (see **Figure 10**), however the adjoining future development will provide a reticulated water supply. The limitations on the water supply will need to be considered as part of any planned fire operations and activities, as well as in the event of any unplanned fire.

4.6 Fire regimes for biodiversity conservation

An objective of this BMP is to '*Provide appropriate fire regimes and hazard reduction activities to support CAMP requirements / offset requirements under the EPBC Act and avoid detrimental impacts on species, communities, populations and culturally significant assets'.* Management of fire is therefore guided by the following general biodiversity conservation principles:

- Groups of plant and animal species respond similarly to fire according to characteristics of their life history
- Depending on the attributes of individual species, variation in components of the fire regime may facilitate local species extinctions (Keith 1996)
- It is not necessary to specify fire regimes for the conservation of every species and an overview of the requirements for broad groups of species can be applied. Requirements for most plant species can be summarised on the basis of a small number of groups with common fire requirements
- Flora are commonly categorised into three broad groups based on their response to fire (Naveh 1975):
    - 'Obligate seed regenerators' generally regenerate only by seed
    - 'Obligate re-sprouters' generally regenerate solely by re-sprouting
    - 'Facultative re-sprouters' regenerate by seed and re-sprouting
- Plant and animal communities are inextricably linked. Plants form an important component of habitat for animals
- A diversity of fire regimes may be needed to maintain biodiversity. This means that over time, there is a place for fires of high, moderate and low intensity, frequency and size. Extinctions may be likely when fire regimes of relatively fixed intensity, frequency and extent prevail without variation
- Much of the vegetation within the site is highly adapted to fire.

Prescribed burns should be conducted in accordance with *Regional Ecosystem Fire Guidelines* (Queensland Department of Environment and Science, 2018). The guidelines are from an ecological perspective, designed to maintain and enhance biodiversity and the essential structural and compositional characteristics of each regional ecosystem (RE).

Table 6 provides fire regime guidelines for the REs mapped on site, as detailed in the *Regional Ecosystem Fire Guidelines*. Variable fire regimes for these REs are required to avoid a decline in biodiversity. It will be important to vary the frequency, intensity, season and pattern of burns within the limits set by the guidelines for each RE identified in **Table 6** and on **Figure 11**.

A written permit from a Rural Fire Service Fire warden is mandatory for all prescribed burns. Management of fire within the Conservation Area will be directed by the CAMP Environmental Manager in consultation and coordination with the Rural Fire Service (RFS), ICC and DES (as owner of the adjacent Conservation Park, with ICC managing the area through a formal trusteeship).

Table 6: Fire regime guidelines for conservation of biodiversity (Queensland Department of Environment and Science, 2018)

Regional Ecosystem and description	Fire interval (From Figure 10)	Fire Guidelines
12.9-10.2 ***Corymbia citriodora*** subsp. ***variegata*** +/- ***Eucalyptus crebra*** **open forest on sedimentary rocks**	4 – 25 years	SEASON: Summer to winter. INTENSITY: Low to moderate. INTERVAL: 4-25 years. STRATEGY: Aim for 40-60% mosaic burn. Burn with soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is achieved. ISSUES: The fire regime should maintain a mosaic of grassy and shrubby understoreys. Control of weeds is a major focus of planned burning in most areas. Careful thought should be given to maintaining ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas. Variability in season and fire intensity is important, as well as spot ignition in cooler or moister periods to encourage mosaics. There is evidence that the spiral leaf Macrozamias (e.g. *M. parcifolia*) decline in health if fire interval is greater than 6 years.
12.9-10.7a ***Eucalyptus crebra*** +/- ***E. tereticornis, Corymbia tessellaris, Angophora*** **spp.**, ***E. melanophloia*** **woodland on sedimentary rocks**	4 – 25 years	SEASON: Summer to winter. INTENSITY: Low to moderate. INTERVAL: 4-25 years. STRATEGY: Aim for 40-60% mosaic burn. Burn with soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is achieved. ISSUES: The fire regime should maintain a mosaic of grassy and shrubby understoreys. Control of weeds is a major focus of planned burning in most areas. Careful thought should be given to maintaining ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas. Variability in season and fire intensity is important, as well as spot ignition in cooler or moister periods to encourage mosaics.

Regional Ecosystem and description	Fire interval (From Figure 10)	Fire Guidelines
12.8.24 ***Corymbia citriodora* subsp. *variegata* open forest on Cainozoic igneous rocks especially trachyte**	4 – 25 years	SEASON: Summer to winter. INTENSITY: Low to moderate. INTERVAL: 4-25 years. STRATEGY: Aim for 40-60% mosaic burn. Burn with soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is achieved. ISSUES: The fire regime should maintain a mosaic of grassy and shrubby understoreys. Control of weeds is a major focus of planned burning in most areas. Careful thought should be given to maintaining ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas. Variability in season and fire intensity is important, as well as spot ignition in cooler or moister periods to encourage mosaics.
12.9-10.17 ***Eucalyptus acmenoides, E. major, E. siderophloia* +/- *Corymbia citriodora* subsp. *variegata* woodland on sedimentary rocks**	8 – 20 years	SEASON: Summer to winter INTENSITY: Plan for low to moderate. Unplanned occasional high intensity wildfire will occur. INTERVAL: 4-8 years maintains a healthy grassy system. 8-20 years for shrubby elements of understorey. STRATEGY: Aim for 40-60% mosaic burn. Needs disturbance to maintain RE structure (eucalypt overstorey with open understorey of predominantly non-rainforest species). Any moist sclerophyll that is relatively open with a mixture of grasses and shrubs should be a priority for fire management to retain RE structure. ISSUES: Frequent fire is needed to maintain understorey integrity, keeping more mesic species low in the profile of the understorey so that other species can compete. It is essential that wildfires are not the sole source of fire in this ecosystem. High intensity fires occur periodically through time, however frequent low to moderate intensity fires will create the disturbance required to keep the understorey diverse. A follow-up burn soon after a high intensity wildfire can be considered to reduce germinating mesic species. This RE may contain a high number of rare and threatened plant species which require appropriate fire management.
12.8.17 ***Eucalyptus melanophloia +/- E. crebra, E. tereticornis, Corymbia tessellaris* woodland on Cainozoic igneous rocks**	3 – 6 years	SEASON: Summer to late-autumn. INTENSITY: Low. INTERVAL: 3-6 years. STRATEGY: Aim to burn 40-60% of any given area. Spot ignition in cooler or moister periods encourages mosaics. ISSUES: Control of weeds is a major focus of planned burning in most areas. Maintain ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas.

Regional Ecosystem and description	Fire interval (From Figure 10)	Fire Guidelines
12.3.3 ***Eucalyptus tereticornis*** **woodland on Quaternary alluvium**	3 – 6 years	SEASON: Summer to late-autumn. INTENSITY: Low. INTERVAL: 3-6 years. STRATEGY: Aim to burn 40-60% of any given area. Spot ignition in cooler or moister periods encourages mosaics. ISSUES: Control of weeds is a major focus of planned burning in most areas. Maintain ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas.

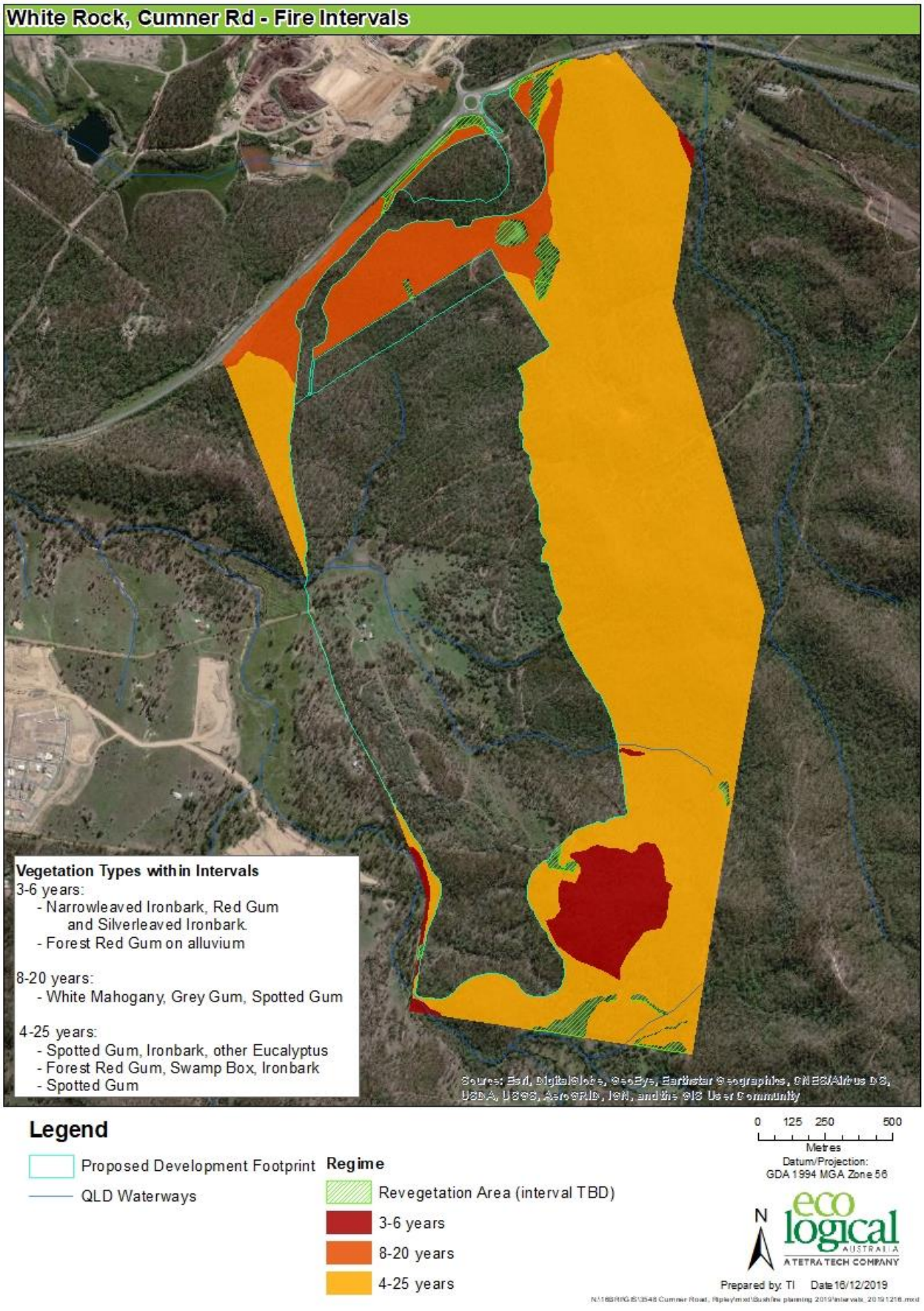

Figure 11. Fire intervals

4.7 Threatened species management

4.7.1 Threatened fauna safeguards

The major effects of fire on animals are through changes to their habitat and the availability of food, shelter and breeding sites (Williams & Gill 1995). Thus, the effect of fire regimes on the habitat requirements of animals is significant.

Although further research is required, it appears necessary to ensure a diversity of age classes in appropriate vegetation types for the maintenance of animal species (Williams & Gill 1995). Whilst endeavouring to provide this, care must be taken to avoid unnecessary, severe impact on animals when implementing these guidelines. Burning a large proportion of available habitat; burning during breeding seasons; or burning prior to the dispersal of young, may have a long-term detrimental effect on isolated animal populations. The availability of nectar flow from flowering plants is another important consideration for both vertebrate and invertebrate species. It is desirable that any individual fire, or the combination of fires within a short period of time, should not completely burn the local extent of a vegetation community or habitat type.

Most canopy species found within the Conservation Area are lignotuberous, and contribute seed more or less continuously, relying on gaps and cool fires to provide establishment opportunities. They are not designed for wholescale stand replacement. The eucalypt species found on site generally do not store much seed in the canopy, so crown fires are not required for regeneration.

Specific safeguards for threatened fauna species are provided in **Table 7,** with specific reference to safeguards applying to koala and GHFF target species noted.

Table 7: Fire management safeguards (practices to avoid) for threatened fauna

Safeguard option	Where possible, in locations of known populations and/or core habitat:	Koala	GHFF
Safeguard 1	Avoid fire regimes beyond fire interval thresholds of the native vegetation communities making up the species' habitat	X	X
Safeguard 2	Avoid burning more than 30% of the local habitat of the species in any year	X	X
Safeguard 3	Avoid size of each burn patch being >50% of the smaller home range of the species	X	X
Safeguard 4	Avoid actual area burned being >75% of the total area within a burn perimeter	X	X
Safeguard 5	Avoid burning a small total area where post-fire herbivore overgrazing is a concern		
Safeguard 6	Avoid lighting up more than 50% of the burn perimeter and allow fire to spread in a single direction. Avoid situations resulting in converging fire lines with no escape routes.	X	X
Safeguard 7	Avoid burning in breeding season. If a number of species with different breeding seasons occur in the burn area, avoid the breeding season of the most fire sensitive species.	X	X
Safeguard 8	Avoid high intensity fire by minimising the size of wildfires, ignition times during mid-day, ignition during higher fire danger periods and if possible suppressing wildfires prior to it affecting the population. Prescribed burning may be appropriate to reduce nearby fuel loads in the direction from which wildfire is expected.	X	X
Safeguard 9	Avoid scorching the over-storey canopy during prescribed burning	X	
Safeguard 10	Avoid placing infrastructure (e.g. temporary utilities, re-routing trails, etc.) within habitat or near nesting and roosting sites	X	X
Safeguard 11	Avoid felling hollow-bearing trees during mop-up and control line construction		X
Safeguard 12	Avoid burning known den trees and roost sites during prescribed burning	X	X
Safeguard 13	Avoid felling feed trees during mop-up and control line construction	X	
Safeguard 14	Avoid predation by, or competition with, feral animals (in areas where they occur) by implementing appropriate feral animal control measures in conjunction with the prescribed burning	X	X

4.8 Weed management

Where fuel/vegetation reduction and access maintenance works occur, it is recommended that all vehicles and machinery likely to disturb the soil are to be cleaned prior to, during and after these activities to reduce the spread of weeds.

As bushfires may exacerbate weed infestations, it is recommended that weed control occurs within 6 months of any bushfire. Weed management strategies are further described in the CAMP. **Table 8** outlines safeguards to reduce the spread of weeds during fire management activities.

Table 8: Safeguards when carrying out fire management activities in sites containing exotic plant species

Potential impact	Safeguards (or ameliorative measures) to mitigate the impact
Exotic seeds introduced on machinery and boots during fire management activities	Wash down all vehicles and machinery likely to disturb the soil prior to, during and after fuel management, prescribed burning or trail maintenance activities. Vehicles and machinery regularly used in wildfire suppression should be thoroughly cleaned on a regular basis. Carry out weed management following the fire management activities.
Weed distribution and abundance increased as a result of fire management activities	Carry out weed control following the fire management activities. Avoid movement through weed infested areas. Wash down all vehicles and machinery that are likely to disturb the soil during prescribed burning or trail maintenance activities.
Environmental conditions that favour the expansion of exotic species are created by fire regimes	Minimise size of burn areas by slashing or other (non-fire) fuel reduction in previously cleared sites on site that have heavy weed infestation. Delay burning if burning at the proposed time will exceed fire interval threshold. Whenever possible, avoid scorching the overstorey canopy during prescribed burning.

5. Monitoring, review and evaluation

All strategies and plans must have mechanisms that show that progress is being made in successfully completing the prescribed actions. It is also necessary to determine the effectiveness of the plan and efficiency of individual or collective actions.

5.1 Scheduled review of the plan

5.1.1 Annual review

Annual reviews of the plan should be done when preparing annual work programs. Small changes to the actions and strategies may occur within the plan without formally discussing the changes with stakeholders. Matters that require a more significant variation, such as the establishment of new access track or trails, development of any infrastructure (eg recreational facilities, visitors centres etc) should be discussed with any affected stakeholders.

A reporting and feedback mechanism should be put in place to assess the implementation of annual works, if management standards are achieved (i.e. for fuel management and trail maintenance), any fire events that have occurred, any changes to the development footprints for the site, and any changes to vegetation management practices to the site.

5.1.2 Five yearly review

A complete evaluation, review and updating of the plan should occur after five years (i.e. the lifespan of the BMP). The review should:

- Consider whether the plan has achieved the objectives set out in Section 1.2
- Integrate results of CAMP ecological monitoring (where relevant) so this plan can continue to support CAMP outcomes
- Re-assess the strategies and environmental safeguards in light of current research and management best practice
- Re-assess the strategies taking into account the legislative changes, financial constraints, social philosophies, improvements in bushfire protection and suppression, and changes in vegetation
- Consider any new construction
- Consider any findings and recommendations following major bush fire events for the region
- Consider feedback and evaluation from the annual review of implementation of the BMP.

5.2 Post fire event review of the plan

It is important after every wildfire and prescribed burn and after every fire season to review whether the BMP for each site is being effectively implemented. The BMP may be considered to be successful if the objectives in Section 1.2 have been achieved, that is if CAMP outcomes have been supported through the implementation of this plan and if there has been no loss of life, no person is injured, and there has been no loss of property, infrastructure, or significant impact on the operations or biodiversity values. However, this may not give a true assessment as to whether the strategies and actions have been sufficient. Other factors, such as favourable weather conditions and or lack of any fires, may give a misleading impression as to the adequacy of the strategies in the BMP. In short, implementation of

the BMP and the actions and strategies contained within is expected to reduce the risk, however, monitoring and evaluating is critical to ensure these strategies and actions are sufficient and efficient.

5.3 Other triggers for review of the plan

It is vital in maintaining consistency and quality of implementation of the bushfire mitigation works. Changes in the program could be required for the reasons identified in **Table 9** below.

Table 9: Reasons for reviewing bushfire mitigation works

Event	Potential consequence to the bushfire mitigation program
New buildings / assets	Amendment may be required to ensure building bushfire protection measures are in place or are maintained (e.g. asset protection zones, building and access maintenance).
Wildfire	Amendments to the bushfire protection provisions may be required if, through post fire debrief and analysis, they are found to be deficient, i.e. bushfire protection systems not sufficient to prevent impact on asset.
Legislative and policy changes	Could affect the feasibility, timing and priorities.
Weather not conducive to mitigation works	Mitigation works may need to be postponed until more favourable conditions occur.
Resource expansion and/or contraction	Mitigation works scheduled for the year may need to be prioritised to facilitate restricted resource allocation. Lower priority works may need to be postponed. Capital works scheduled in subsequent years may be brought forward. Extent of individual works to increase/decrease.

5.4 Actions Required After Bushfire

The following information (as a minimum) is to be recorded after each bushfire or prescribed burn. All records compiled during the course of a fire are to be collated in chronological order. Records are to be stored on a new file for each fire year. A simple filing system should be established.

A fire report should be completed for every fire (including small fires and ignitions), and include information such as fuel reduction estimates, scorch heights, percentage of area burnt, information on fire behaviour where available (such as flame heights, rate of spread), weather conditions at time of fire, and suspected ignition source. A map of the fire should be prepared. Fire mapping should include known or suspected ignition point/s, fire perimeter, fire paths, asset damage, islands of unburnt areas, fire control lines, and other information specific to the fire.

Fire history records for each campus should be kept up to date and completed within a week of a fire.

5.5 Post-fire Analysis

Post-fire analysis to determine effectiveness of bushfire and management prescriptions may be achieved through the following:

- Assessment of BMP implementation by regular auditing
- Annual monitoring and evaluation against the BMP's objectives and actions.

This is not a complete list and all actions identified in the BMP should be evaluated and monitored for their effectiveness.

5.5.1 Briefing, Debriefing and Incident Analysis

A debrief should be undertaken after every fire. The following matters may be considered in the debrief:

- History of the fire
- The effectiveness of fire suppression strategies used
- Assets affected
- Resident and neighbour responses
- Review of operations; detection, initial response, access, asset protection, adequacy of strategies, health and safety, adequacy of fire information, preparedness, co-ordination arrangements, liaison with fire authorities and adequacy of staff training, transport
- What went right and what didn't.

A written record of the debrief is to be kept and used for decision on further action and where necessary, changes to the BMP.

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Appendix A White Rock Conservation Area Bushfire Management Plan and Risk Dashboard

January 2020, Version Number: 1

Background

This risk dashboard identifies and ranks factors that influence bushfire risk within and surrounding the Conservation Area. This map based plan compliments the White Rock Urban Development Bushfire Management Plan for Conservation Area, which provides details on the risk management framework and vulnerability factor ratings and rankings, and has been developed to be consistent with the White Rock – Spring Mountain Fire Management Strategic Plan and Risk Dashboard (GHD 2017) for the adjoining conservation reserve that this conservation area will enhance.

This plan also compliments the Cumner Road, White Rock Context Plan – Strategic Bushfire Hazard Assessment and Management Plan (MWH, June 2017), which determines the bushfire protection measures, including Asset Protection Zones, for the proposed development.

Approach

The Conservation Area has been assessed using the nine bushfire risk factors listed A – I in the table opposite.

Bushfire Vulnerability Factor	Column
Ecological Asset Bushfire Sensitivity Risk	A
Ecological Health Risk	B
Fire Severity Risk	C
Bushfire Attack Level Risk	D
Access Risk	E
Housing Stock Risk	F
Fire Vulnerability and Smoke Sensitive Asset Risk	G
Landscape Vegetation Cover Risk	H
Fire Suppression Risk	I

Risk Summary

The White Rock – Spring Mountain Reserve connects directly to the east of the conservation area. A nature reserve is south of the Conservation Area, with the future urban development area to the west. The Centenary highway runs along the north of the site. A number of proposed walking and recreational trails are proposed through the Conservation Area. A number of these trails occur in High risk fire management blocks.

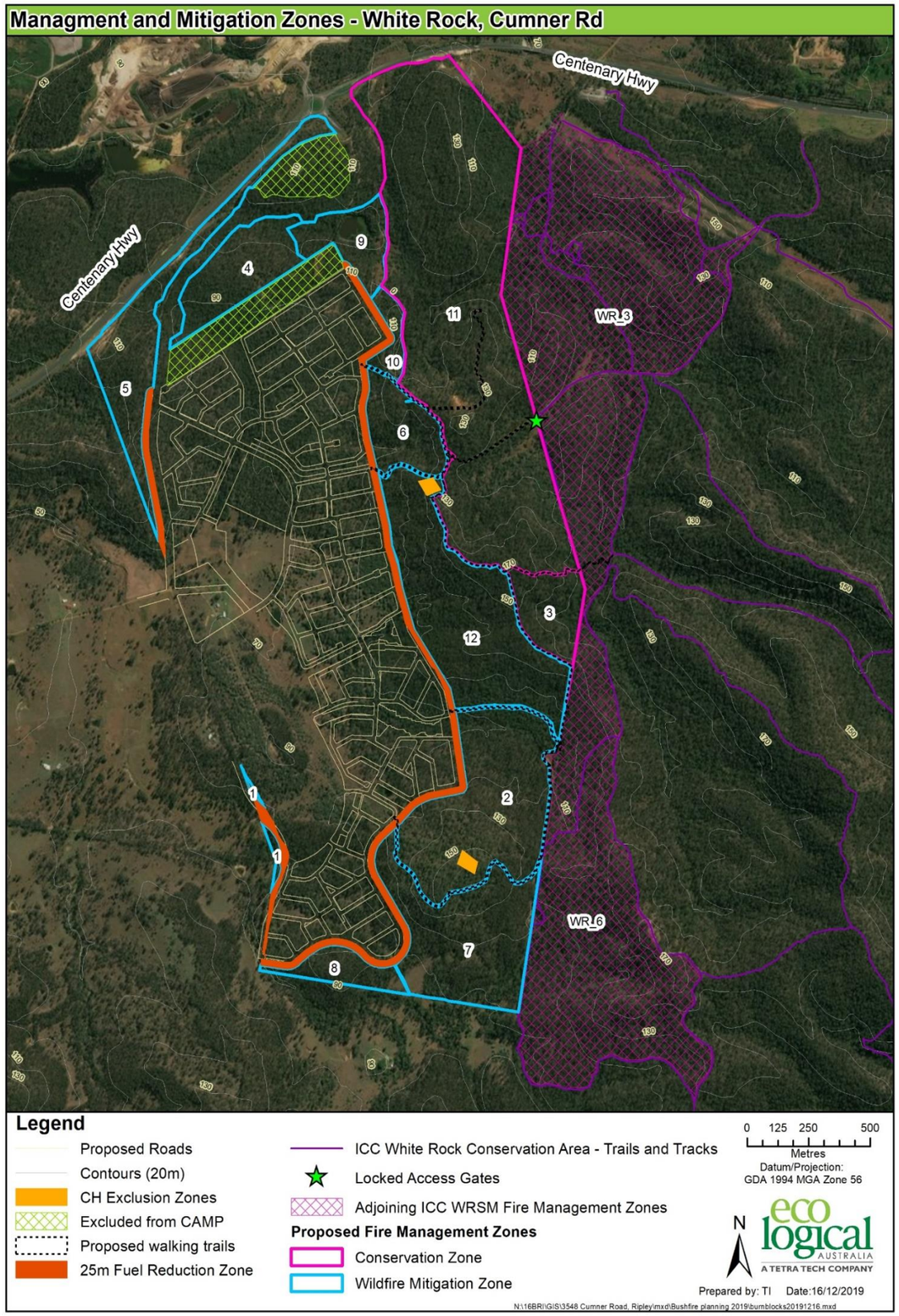
The Conservation Area is connected to the east and south with largely unmanaged vegetation that is capable of supporting a large scale fire at Very high and High potential bushfire intensities.

The main factors driving bushfire risk in the Conservation Area are:

- Fire severity and surrounding landscape vegetation cover risks
- Fire suppression success rate (access and steep terrain)

The risk table provided overleaf contains mitigation actions for each fire management block, with acronyms used detailed in the table below

Acronym	Mitigation activity
PZ	Maintain protection zone to required standard
FT	Maintain fire trails in accessible and stable condition, as per ICC NAE Standard (Service tracks and Firebreaks)
PR	Maintain public roads in accessible and stable condition
PB	Maintain routine prescribed burning of blocks to maintain lower fuel loads, reduce fire intensity and rate of spread. The desired overall fuel hazard should correspond to the blocks zoning class
CR	Close reserve (Conservation Area) on total fire ban days and when fires are burning in the surrounding landscape
VR	Vegetation removal/modification through activities such as slashing, manual removal, tree pruning (no fire)
EF	Exclude fire from vegetation communities which are fire sensitive
RA	Residents adjoining the conservation area may be vulnerable to bushfire impacts. Residents take action to reduce vulnerability by actively managing vegetation on lots and/or maintaining structures to improve bushfire resistance
BSP	Prepare and implement QFES Bushfire Safety Plan
CE	QFES Community Education



Fire Management Block	Hectares	(A) Ecological asset bushfire [illegible]	(B) Ecological health risk	(C) Fire severity risk	(D) Bushfire Attack Level Risk	(E) Access risk	(F) Housing Stock risk	(G) Fire vulnerable and smoke [illegible]	(H) Surrounding landscape vegetation risk	(I) Fire suppression success risk	Prioritisation score	Summary notes	Unmitigated risk	Mitigation strategy	Residual risk	Property owners and Fire Emergency Services Actions	Residual risk after shared responsibility actions
1	0.85	Low	High	High	High	Very high	Low	High	Moderate	Low	21	Small narrow block on western edge of future development, not part of CAMP – may result in managed vegetation and no future actions required. Smoke and embers from fires may impact residences. No prescribed burning.	Medium (tolerable)	PZ, PR, VR	Low (acceptable)	RA, BSP, CE	Low (acceptable)
2	31.08	Low	High	Very high	High	High	Low	High	Very high	Very high	26	Fire trails bound the block, which connects to White Rock Conservation Estate management block WR_6. The area will support a fire run that may enter the adjoining Conservation Reserve to the east under westerly winds or the future urban area to the west under easterly winds. Intense fire behavior could result in loss of or damage to environmental values. Smoke and embers from fires may impact residences.	Medium (tolerable)	PZ, FT, PR, PB, CR	Low (acceptable)	RA, BSP, CE	Low (acceptable)
3	8.07	Low	High	Moderate	Moderate	Very high	Not applicable	Moderate	Very high	Very high	22	Fire trails on northern and southern boundaries of the block, with the eastern boundary connection to White Rock Conservation Estate management block WR_6. The area will support a fire run that may enter the adjoining Conservation Reserve to the east under westerly winds. Intense fire behavior could result in loss of or damage to environmental values. Smoke and embers from fires may impact residences	Medium (tolerable)	FT, PB	Low (acceptable)	CE	Low (acceptable)
4	19.24	Low	High	High	Moderate	Very high	Not applicable	High	Very high	Moderate	22	Access road to future urban development along northern boundary of the block, with an area excluded from the CAMP but part of this plan to the south of the block. Smoke and embers may impact Centenary Highway and residences	Medium (tolerable)	PR, PB	Low (acceptable)	CE	Low (acceptable)
5	23.96	Low	High	High	Moderate	High	Low	Very high	Very high	Moderate	23	Access road to future urban development along southern and eastern boundary of the block, Centenary Highway bounds the north. FMB contains an area excluded from the CAMP but part of this plan. Smoke and embers may impact Centenary Highway and residences	High (intolerable)	PZ, PR, PB, VR	Medium (tolerable)	CE	Low (acceptable)
6	9.06	Low	High	Very high	High	High	Low	High	Very high	High	25	Fire trails bound the block to the east and south, with future urban development roads bounding the western boundary. The area will support a fire run that may enter the future urban area to the west under easterly winds. Intense fire behavior could result in loss of or damage to environmental values. Smoke and embers from fires may impact residences.	Medium (tolerable)	PZ, FT, PR, PB	Low (acceptable)	RA, BSP, CE	Low (acceptable)
7	25.61	Low	High	High	High	High	Low	High	Very high	Very high	25	Fire trails on northern boundaries of the block, future urban development roads to the west with the eastern boundary connection to White Rock Conservation Estate management block WR_6. The area will support a fire run that may enter the adjoining Conservation Reserve to the east under westerly winds or the future urban area to the west under easterly winds. Intense fire behavior could result in loss of or damage to environmental values. Smoke and embers from fires may impact residences	Medium (tolerable)	PZ, FT, PR, PB, CR	Low (acceptable)	RA, BSP, CE	Low (acceptable)
8	5.14	Low	High	Very high	High	High	Low	High	Very high	High	25	Future urban development roads to the north. The area will support a fire run that may enter the adjoining land to the south or the future urban area to the west under differing winds. Intense fire behavior could result in loss of or damage to environmental values. Smoke and embers from fires may impact residences	Medium (tolerable)	PZ, PR, PB, CR	Low (acceptable)	RA, BSP, CE	Low (acceptable)
9	8.06	Low	High	Very high	High	Very high	Low	High	Very high	High	26	Fire trails bound the block to the east and north, with future urban development roads bounding the south-western boundary. The area will support a fire run that may enter the future urban area to the west under easterly winds. Intense fire behavior could result in loss of or damage to environmental values. Smoke and embers from fires may impact residences.	Medium (tolerable)	PZ, FT, PR, PB, CR	Low (acceptable)	RA, BSP, CE	Low (acceptable)
10	3.07	Low	High	High	High	High	Low	High	Very high	High	24	Fire trails bound the block to the east and south, with future urban development roads bounding the western boundary. The area will support a fire run that may enter the future urban area to the west under easterly winds. Intense fire behavior could result in loss of or damage to environmental values. Smoke and embers from fires may impact residences.	Medium (tolerable)	PZ, FT, PR, PB, CR	Low (acceptable)	RA, BSP, CE	Low (acceptable)
11	93.95	Low	High	High	Moderate	Ver high	Not applicable	Very high	Very high	Very high	25	Fire trails on western and southern boundaries of the block, with the eastern boundary connection to White Rock Conservation Estate management block WR_3. The area will support a fire run that may enter the adjoining Conservation Reserve to the east under westerly winds. Intense fire behavior could result in loss of or damage to environmental values. Smoke and embers may impact Centenary Highway and transmission line	High (intolerable)	FT, PB, CR	Medium (tolerable)	CE	Low (acceptable)
12	35.06	Low	High	High	High	High	Low	High	Very high	Very high	25	Fire trails bound the block to the east and south, with future urban development roads bounding the western boundary. with the eastern boundary connection to White Rock Conservation Estate management block WR_6. The area will support a fire run that may enter the adjoining Conservation Reserve to the east under westerly winds or the future urban area to the west under easterly winds. Intense fire behavior could result in loss of or damage to environmental values.	Medium (tolerable)	PZ, FT, PR, PB, CR	Low (acceptable)	RA, BSP, CE	Low (acceptable)

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