Appendix C:

Strategic Bushfire Study

Bushfire Planning Australia

BUSHFIRE PLANNING AUSTRALIA

STRATEGIC BUSHFIRE STUDY

Broken Head Quarry, Broken Head

Winten Property Group

Bushfire Planning Australia

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Ref: 2025
Version: FINAL – November 2020

Disclaimer and Limitation

This report is prepared solely for the Winten Property Group (the 'Client') for the specific purposes of only for which it is supplied (the 'Purpose'). This report is not for the benefit of any other person; either directly or indirectly and is strictly limited to the purpose and the facts and matters stated in it and will not be used for any other application.

This report is based on the site conditions surveyed at the time the document was prepared. The assessment of the bushfire threat made in this report is made in good faith based on the information available to Bushfire Planning Australia at the time.

The recommendations contained in this report are considered to be minimum standards and they do not guarantee that a building or assets will not be damaged in a bushfire. In the making of these comments and recommendations it should be understood that the focus of this document is to minimise the threat and impact of a bushfire.

Finally, the implementation of the adopted measures and recommendations within this report will contribute to the amelioration of the potential impact of any bushfire upon the development, but they do not and cannot guarantee that the area will not be affected by bushfire at some time.

Document Status: 2025 – Strategic Bushfire Study

Version	Status	Purpose	Author	Review Date
1	Draft	Draft for Review	Stuart Greville/ Catherine Ryland	21st September 2020
2	Draft	Draft for Client Review	Stuart Greville/ Catherine Ryland	21st September 2020
3	Final	Final for Submission	Stuart Greville/ Catherine Ryland	16th October 2020
4	**FINAL**	**Final for Submission**	**Stuart Greville**	**12th November 2020**

Certification

As the author of this Bushfire Threat Assessment (BAR), I certify this BAR provides the detailed information required by the NSW Rural Fire Service under Clause 44 of the Rural Fires Regulation 2013 and Appendix 2 of Planning for Bushfire Protection 2019 for the purposes of an application for a bush fire safety authority under section 100B(4) of the Rural Fires Act 1997.

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

Stuart Greville

Accredited Bushfire Practitioner

BPAD-26202

Date: 12th November 2020

In signing the above, I declare the report is true and accurate to the best of my knowledge at the time of issue.

Executive Summary

Bushfire Planning Australia (BPA) has been engaged by the Winten Property Group (the 'Client') to undertake a Strategic Bushfire Study (SBS) and Bushfire Assessment Report (BAR) for the proposed residential use of the former Broken Head Quarry site.

A Background Report was prepared in 2014 supporting the re-zoning and subdivision of the former quarry areas of the site to provide 11.82 ha of residential use, subdivided into 42 residential lots between 2,000m^2 and 6,000m, along with 7.35ha local open space and 33.15ha of environmental conservation land.

This SBS finds the site exposed to a high bushfire hazard to the south and a moderate bushfire hazard to the west. The predominant vegetation surrounding the site is consistent with a *forest* vegetation formation, which is fragmented by areas of *rainforest* and *tall heath* vegetation formations as described in the NSW Rural Fire Service document Planning for Bushfire Protection 2019 (PBP 2019). The SBS concludes that the hazard identified can be successfully mitigated by applying the requirements of PBP 2019, along with some additional measures which build in a climate change resilience factor.

In summary, the following key recommendations have been designed to enable any proposed residential proposed development to achieve the aims and objectives of PBP 2019:

1. The entire site shall be managed as an Inner Protection Area (IPA) as outlined within Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;
2. Asset Protection Zones shall be established as shown in **Figure 21** and maintained as outlined Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones. Where an APZ is indicated on public land (road reserve), the vegetation is not required to be managed as an APZ;
3. All land within future stages of the site within 100m of the site shall be managed as a Temporary APZ as outlined Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;
4. Access shall be provided in accordance with Table 5.3b of PBP 2019. This will require the provision of two (2) separate road access points to Broken Head Road from each development site to ensure safe evacuation for all residents;
5. Vegetation within road verges and stormwater basins to be consistent with a grassland vegetation classification with tree canopy less than 10% at maturity (and considered unmanaged);
6. All future dwellings to be constructed on the proposed lots shall have due regard to the specific considerations given in the National Construction Code: Building Code of Australia (BCA) which makes specific reference to Australian Standard AS3959-2018 Construction of buildings in bushfire prone areas (AS3959-2018) and the NASH Standard Steel Framed Construction in Bushfire Prone Areas;
7. All new lots are to be connected to a reliable water supply network and that suitable fire hydrants are located throughout the development site that are clearly marked and provided for the purposes of bushfire protection. Fire hydrant spacing, sizing and pressure shall comply with AS2419.1 2005 and section 5.3.3 of PBP 2019;
8. An additional static water supply of 5,000L per residential lot is to be provided with appropriate equipment and connections complying with section 5.3.3 of PBP 2019;
9. Consideration should be given to landscaping and fuel loads on site to decrease potential fire hazards on site;

10. All future landowners should prepare a Bushfire Survival Plan in accordance with the RFS guide to preparing a Bushfire Survival Plan; and
11. A Fire Management Strategy or Fire for Conservation Management Plan shall be prepared for the residue lot in accordance with the RFS Bush Fire Environmental Assessment Code and the RFS Rules and Notes for implementation of the Threatened Species Hazard Reduction List for the Bush Fire Environmental Assessment Code.
12. A vegetation plan of management shall be prepared for future subdivision application(s) to ensure that any vegetation regrowth on site will be kept to manageable levels and there will be no fire corridor created which could spread fire towards assets.
13. A community education plan shall be prepared to provide education programs to the future community regarding bush fire risk and emergency response.

This assessment has been made based on the bushfire hazards observed in and around the site at the time of inspection and production (September 2020).

Should the above recommendations be implemented, the existing bushfire risk should be suitably mitigated to offer an acceptable level of protection to life and property for those persons and assets occupying the site but they do not and cannot guarantee that the area will not be affected by bushfire at some time and that property and life damage/loss will not occur.

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Terms and Abbreviations

Abbreviation	Meaning
APZ	Asset Protection Zone
AS2419-2005	Australian Standard – Fire Hydrant Installations
AS3959-2018	Australian Standard – Construction of Buildings in Bush Fire Prone Areas
BAR	Bushfire Assessment Report
BCA	Building Code of Australia
BC Act	NSW Biodiversity Act 2016
BMP	Bush Fire Management Plan
BPA	Bush Fire Prone Area (Also Bushfire Prone Land)
BPL	Bush Fire Prone Land
BPLM	Bush Fire Prone Land Map
BPM	Bush Fire Protection Measures
BSC	Byron Shire Council
DoE	Commonwealth Department of the Environment
DPI Water	NSW Department of Primary Industries – Water
EPA Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
FDI	Fire Danger Index
FMP	Fuel Management Plan
ha	hectare
IPA	Inner Protection Area
LGA	Local Government Area
OPA	Outer Protection Area
OEH	NSW Office of Environment and Heritage
PBP 2019	Planning for Bushfire Protection 2019
RF Act	Rural Fires Act 1997
RF Regulation	Rural Fires Regulation
RFS	NSW Rural Fire Service
TSC Act	NSW Threatened Species Conservation Act 1995 (as repealed)

1. Introduction

Bushfire Planning Australia (BPA) has been appointed by the Winten Property Group (the 'Client') to undertake a Strategic Bushfire Study (SBS) and Bushfire Assessment Report (BAR) for the proposed residential use of the former Broken Head Quarry ("the site").

The assessment aims to provide a strategic bushfire risk assessment which considers and assesses the bushfire hazard and associated potential bushfire threat relevant to the proposed development on a landscape scale. The assessment outlines the minimum mitigative measures which would be required in accordance with the SBS, provisions of the New South Wales Rural Fire Service (RFS) publication *Planning for Bushfire Protection 2019* (PBP 2019) and the *Rural Fires Regulation 2013*.

1.1. Aims and Objectives

This SBS aims to assess the bushfire threat and recommends a series of bushfire protection measures that aim to minimise the risk of adverse impact of bush fires on life, property and the environment.

This assessment has been undertaken in accordance with Chapter 4 of *Planning for Bushfire Protection 2019,* the Section 9.1 Ministerial Directions and clause 44 of the *Rural Fires Regulation 2013*. This assessment also addresses the aim and objectives of PBP 2019, being:

- The protection of human life and the minimisation of impacts on property from the threat of bushfire, while having due regard to development potential, site characteristics and protection of the environment; and
- Afford buildings and their occupants protection from exposure to a bushfire;
- Provide a defendable space to be located around buildings;
- Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevents the likely fire spread to buildings;
- Ensure that appropriate operational access and egress for emergency service personnel and occupants is available;
- Provide for ongoing management and maintenance of BPMs; and
- Ensure that utility services are adequate to meet the needs of firefighters.

1.2. Strategic Bushfire Planning

This report supports an application for a strategic development proposal and therefore provides a Strategic Bush Fire Study (SBS) in accordance with Chapter 4 of Planning for Bush Fire Protection 2019. The SBS responds to high level guidance regarding the need to assess the appropriateness of future development sites prior to creating development expectations.

The SBS reviews the bushfire context within a radius of 2km, which for site this size is considered to be an appropriate distance. The 2km bushfire context provides a picture of the surrounding landscape, vegetation communities and topography. Along with an assessment of the road network and emergency management framework, the SBS reviews the appropriateness of the proposed land use. The SBS also makes recommendations for appropriate bushfire protection measures required for future subdivision applications on the site.

In undertaking the SBS and BAR within this report, it can be demonstrated that the proposal meets the requirements of the Section 9.1(2) Direction 4.4 Planning for Bush Fire Protection. In particular:

- the proposed development can provide appropriate asset protection zones within resultant property boundaries (APZ) of inner protection area (IPA) in accordance with the calculated requirements under PBP 2019. A BAL contour plan is submitted to demonstrate this.
  - The IPA is bounded by a perimeter road which circumscribes the hazard side of the land intended for development.

- the proposed development contains provisions for a two-way perimeter road around the entire development, providing access to/from all lots within the resultant subdivision. The perimeter road links directly to a main distributor road within the public road network.
- the proposed development will provide adequate water supply for firefighting purposes via a connection to the reticulated water system,
- the perimeter of the area of land interfacing the hazard is minimised by the perimeter road which provides hardstand APZ around the perimeter of the development,
- introduce controls on the placement of combustible materials in the Inner Protection Area.

2. Site Description

Table 1: Site Description

Address	Broken Head Road, Broken Head
Title	Lot 1 DP 123302 Lot 1 DP 184443 Lot 2 DP 700806
LGA	Byron Shire Council
Subject Site/ Study Area	57.17 ha
Development Site	19.17ha
Land Use Zone	RU1 Primary Production and DM Deferred Matter (**Figure 3**)
Bushfire Prone Land	YES – Vegetation Category 1 and Vegetation Buffer (**Figure 4**)
Context	Former Broken Head Quarry, partially rehabilitated
Topography	Undulating
Fire History	No fire history directly impacting site

Broken Head Quarry

Figure 1

Site Location

BUSHFIRE PLANNING AUSTRALIA

The Subject Site
100m Buffer
140m Buffer
Watercourse

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 08/09/19

N
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0 50 100 150 200
Meters

A3 Scale: 1:4,000

File:BrokenHdQuarry_Fig1_SiteLocation_200923 Date: 16/10/2020

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Broken Head Quarry

Figure 2

Site Context

BUSHFIRE PLANNING AUSTRALIA

The Subject Site

100m Buffer

140m Buffer

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Aerial Photo: Maxar 7/19/2019

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0 0.5 1 1.5 2
Kilometers

A3 Scale: 1:40,000

File:BrokenHdQuarry_Fig2_SiteContext_200923 Date: 16/10/2020

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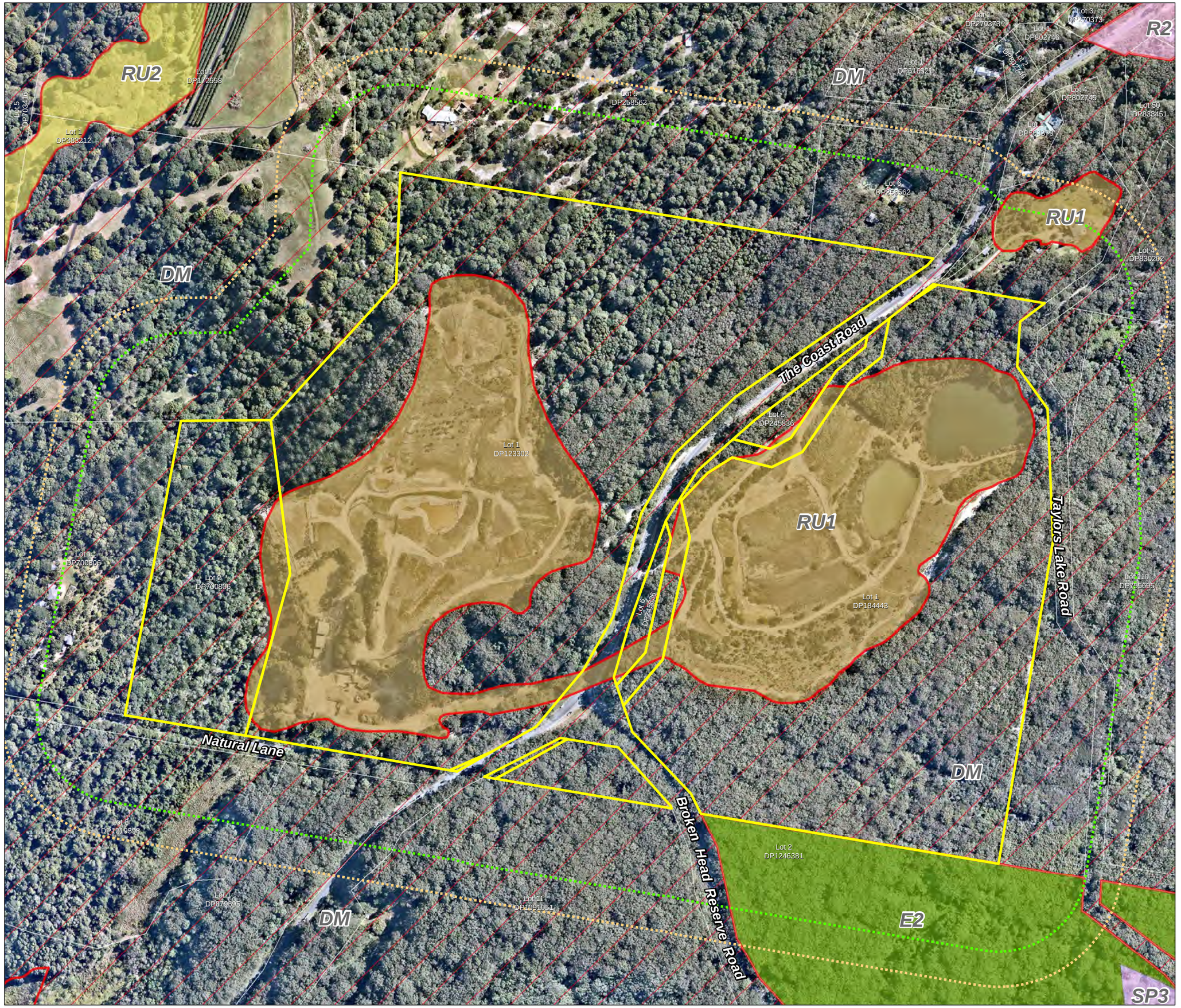
Broken Head Quarry

Figure 3

Existing Land Use Zone



BUSHFIRE PLANNING AUSTRALIA

- Subject Site
- 100m Buffer
- 140m Buffer
- E2 Environmental Conservation
- R2 Low Density Residential
- RU1 Primary Production
- RU2 Rural Landscape
- SP3 Tourist
- DM Deferred Matter

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Zoning: NSW Department of Planning and Environment 2020
Aerial photo: NearMap 08/09/19

N W E S

0 50 100 150 200
Meters

A3 Scale: 1:4,000

File:BrokenHdQuarry_Fig4_Zoning_200923 Date: 16/10/2020

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2.1. Bushfire Prone Land

Bushfire activity is prevalent in landscapes that carry fuel and the two predominant bushfire types are grassland and forest fires. Factors such as topographic characteristics and quantity of fuel loads influence the intensity and spread of fire. The scale of a bushfire hazard is tailored to the characteristics of the hazard, the size and characteristics of the affected population, types of land use exposed to bushfire, predicted development growth pressures and other factors affecting bushfire risk.

Figure 4 demonstrates that the site is almost entirely mapped as Vegetation Category 1, Vegetation Category 2 and Buffer. There is a small portion of the west side of the quarry site which is not mapped as bushfire prone. Nevertheless, because this area is insignificant in the scale of the site, the assessment has been carried out as if the entire site were mapped as bushfire prone.

Broken Head Quarry

Figure 4

NSW Bush Fire Prone Land

BUSHFIRE PLANNING AUSTRALIA

Subject Site
100m Buffer
140m Buffer

Bushfire Prone Land

Vegetation Category 1
Vegetation Category 2
Buffer

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
NSW Bush Fire Prone Land: NSW Rural Fire Service 2018
Aerial photo: NearMap 08/09/19

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0 50 100 150 200
Meters

A3 Scale: 1:4,000

File:BrokenHdQuarry_Fig3_BFPL_200923 Date: 16/10/2020

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2.2. Fire History

There is no history of bushfire at the site itself and minor fire history in areas surrounding the site. There have been more major fires to the south of the site at Lennox Head, to the north at Byron Bay and further north around Belongil Beach. A series of maps of the fire history in relation to the site's location is provided in **Figure 5**.

The most significant fires have occurred around Lennox Head, approximately 13km to the south of the site. On 29th December 2013, around 60 people were evacuated around Byron Bay Road due to a fire which was started by lightning strike and the coast road between Byron Bay and Lennox Head was closed to traffic. The fire was fanned by southerly winds but was brought under control through active fire suppression. On 12th February 2017, a bushfire burned under a strong northerly wind pushing the fire in a southerly direction. Again, the coast road was closed at Lennox Head. Backburning was undertaken to push the fire west and no properties were threatened by the fire.

There is limited data available regarding the other fires shown on the fire history map, suffice to say that there has not been an event which threatens the site's location.

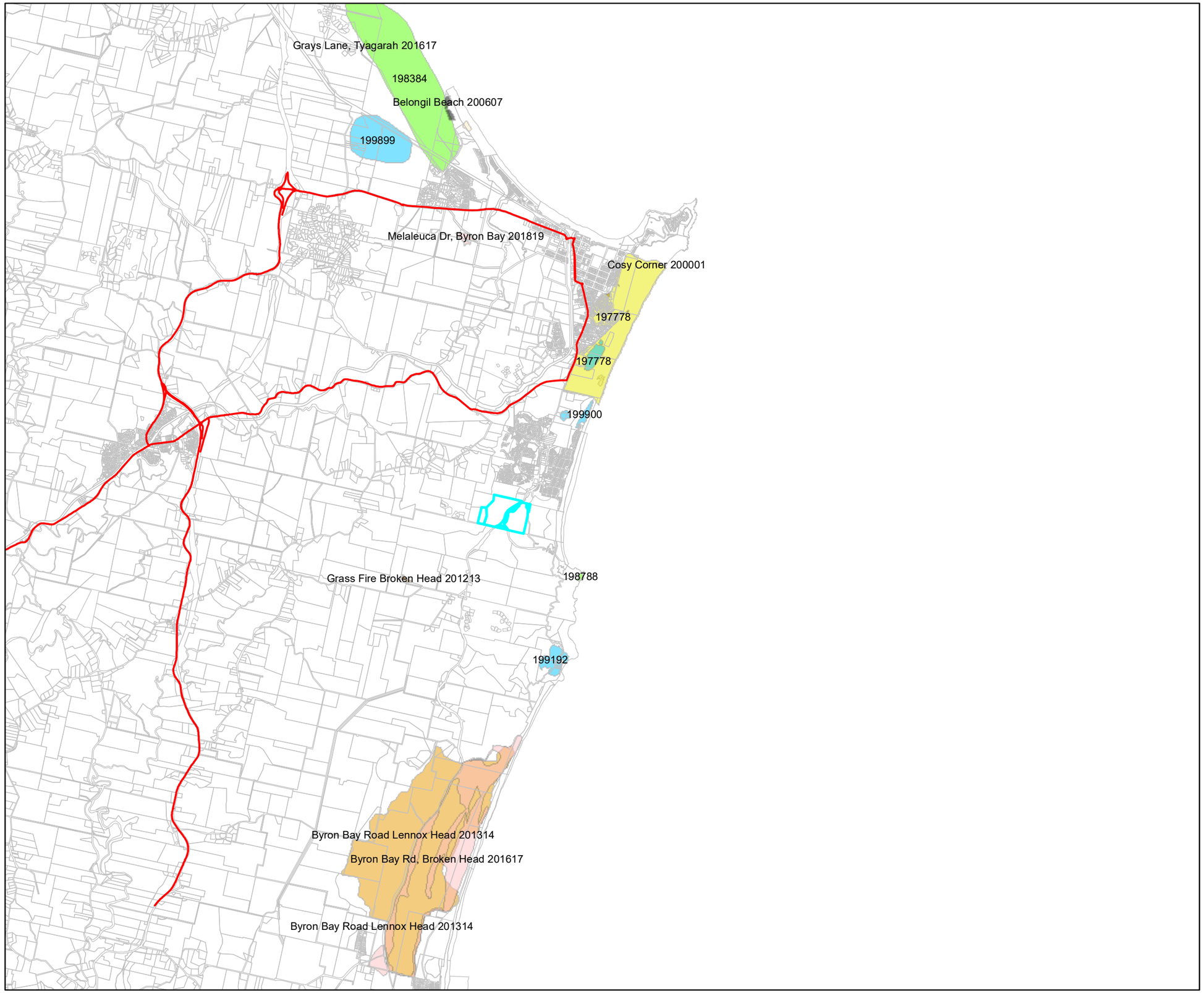

Figure 5
Bushfire History

Scale: 1 : 80,995

0 2 4
Km

LEGEND

PRODUCTION INFORMATION

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Map Details:

Base Data: © LPI, SPOT, AAM, SKM, OEH, Sensis, Kattron
Map Projection: GDA 1994 NSW Lambert
Print Date / Time: 7/09/2020 1:38:52 PM
Produced by: Wayne Sketchley

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KEY MAP

2.3. Proposed Development

This report is prepared in support of a Planning Proposal to rezone the rehabilitated areas of the quarry from RU1 Primary Production and DM Deferred Matter to Ru5 Village and E2 Environmental Conservation.

The intended outcome of the Planning Proposal is to convert cleared and rehabilitated land into community titled large lots purposed for rural residential development. The existing minimum lot size under the current zoning is 40ha, under the proposed new zoning the minimum lot size would be 2,000m^2 with a building height of no more than 9m, or three storeys.

The Planning Proposal is based on a conceptual subdivision design which was prepared in 2014 and is an indicative layout only. It should be noted that any reference to bushfire asset protection zones (APZ) or flame zone in the indicative plan is superseded by this assessment. The conceptual subdivision plan is contained in **Appendix A** and shown in **Figure 6.**

Figure 6: Indicative plan of proposed community title subdivision

3. Bushfire Hazard Assessment

The bushfire hazard assessment will involve quantitative and qualitative assessments of the site. The quantitative assessment includes a detailed site inspection to record and review vegetation communities, slope and aspect both within and surrounding the site. The qualitative assessment will be based on the known bushfire behaviour of the subject land.

3.1. Vegetation Assessment

Vegetation classification over the site and surrounding area has been carried out as follows:

- Aerial Photograph Interpretation to map the vegetation classification and extent (NearMap historical series);
- Site Inspections 1st and 2nd June 2020 by Stuart Greville (BPA);
- Native Vegetation Mapping – Keith Formations - **Figure 7**.
- Byron Shire Council High Environmental Value Vegetation Mapping - **Figure 8**; and
- Vegetation Mapping – Keith Formations – JWA Ecological Consultants - **Figure 9**.

In accordance with Appendix 1 of PBP 2019, an assessment of the vegetation over a distance of 140m in all directions from the site was undertaken. Vegetation that may be considered a bushfire hazard was identified in all directions from the development footprint.

For the purposes of the SBS, vegetation to a distance of 2km from the site has also been assessed. This is discussed in section 4 of this report.

The vegetation on and around the site was verified by a qualified ecologist (Adam McArthur, JWA Ecological Consultants) on 25th May 2020. The verified vegetation mapping is provided in **Figure 9**.

Plate 1: West quarry looking north east towards Cape Byron Lighthouse

Plate 2: Looking south east across west quarry to east quarry

Plate 2: Looking south across the east quarry towards Broken Head

Plate 3: West quarry looking west – *forest* above rim of quarry

Plate 4: *Rainforest* vegetation to the north and west of the west quarry

Plate 5: Broken Head Road looking south

Plate 6: East quarry looking west

Plate 7: Tall heath vegetation is located towards the east

Plate 8: *Forested wetland* leading away from the site to the north east

Broken Head Quarry

Figure 7

NSW Vegetation Formations

BUSHFIRE PLANNING AUSTRALIA

- The Subject Site
- 100m Buffer
- 140m Buffer
- Watercourse

Vegetation Formation

- Cleared
- Dry sclerophyll forests (Shrubby subformation)
- Forested wetlands
- Freshwater wetlands
- Heathlands
- Rainforests
- Wet sclerophyll forests (Grassy subformation)
- Wet sclerophyll forests (Shrubby subformation)

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 19/12/19
NSW Vegetation Formations: NSW Rural Bushfire Service 2015

N W E S

0 50 100 150 200
Meters

A3 Scale: 1:4,000

File:BrokenHdQuarry_Fig6b_VegetationNSW_201117 Date: 17/11/2020

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Broken Head Quarry

Figure 8

High Environmental Value Vegetation

BUSHFIRE PLANNING AUSTRALIA

- The Subject Site
- 100m Buffer
- 140m Buffer
- Watercourse
- Wallum Sand Heaths
- Coastal Dune Dry Sclerophyll Forests
- Coastal Heath Swamps
- North Coast Dry Sclerophyll Forests
- Coastal Swamp Forests
- North Coast Wet Sclerophyll Forests
- Subtropical Rainforests
- Coastal Freshwater Lagoons

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 19/12/19
High Environmental Value Vegetation: Byron Shire Council 2016

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Meters

A3 Scale: 1:4,000

File:BrokenHdQuarry_Fig6a_VegetationHEV_200923 Date: 16/10/2020

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Broken Head Quarry

Figure 9

Ground Truthed Vegetation

BUSHFIRE PLANNING AUSTRALIA

- The Subject Site
- 100m Buffer
- 140m Buffer
- Contour (10m)
- Watercourse
- Zone Boundary
- Forest (North Coast Dry Sclerophyll Forest)
- Regrowth Forest (North Coast Dry Sclerophyll Forest)
- Forested Wetland (Coastal Swamp Forest)
- Rainforest
- Short Heath (Coastal Heath Swamps)
- Tall Heath (Wallum Sand Heath)
- Water

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 19/12/19
Vegetation: JWA Ecological Consultants 2020
Zoning: Department of Planning, Industry and Environment 2020

N W E S

0 50 100 150 200
Meters

A3 Scale: 1:4,000

File:BrokenHdQuarry_Fig6c_VegetationGT_200923 Date: 16/10/2020

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3.2. Slope Assessment

The slope assessment was undertaken as follows:

- Review of LiDAR point cloud data – including DEM (NSW LPI).

An assessment of the slope over a distance of 140m in the hazard direction from the site boundary was undertaken. The effective slope was then calculated under the classified vegetation where there was a fire run greater than 50m. The topography of the site has been evaluated to identify both the average slope and by identifying the maximum slope present. These values help determine the level of gradient which will most significantly influence the fire behaviour of the site.

A series of figures were produced that demonstrate the slope within 140m of the site and also out to 2km from the subject site in several formats, including:

- Digital Elevation Model – **Figure 10** and **11**;
- Topographical Contours (2m contour internals @ 140m and 5m contour intervals @ 2km) – **Figure 12 and 13**; and
- Slope analysis in gradients of 5 degrees – **Figure 14** and **15**.

Broken Head Quarry

Figure 10

Digital Elevation Model

BUSHFIRE PLANNING AUSTRALIA

The Subject Site
100m Buffer
140m Buffer
Contour (10m)
Contour (2m)
Watercourse

Elevation (AHD)
High : 104m
Low : 2m

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 08/09/19
Surface analysis: Derived from ByronBay2010_5566824_56_0002_0002_1m: © Department Finance, Services and Innovation 2010

N W E S

0 50 100 150
Meters

A3 Scale: 1:3,500

File:BrokenHdQuarry_Fig7_DEM_200923 Date: 16/10/2020

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Broken Head Quarry

Figure 11

DEM
2km buffer

BUSHFIRE PLANNING AUSTRALIA

The Subject Site

2km Buffer

Elevation

High : 143m

Low : -1m

SOURCE:
Surface analysis: Derived from ByronBay2010_5566824_56_0002_0002_1m: © Department Finance, Services and Innovation 2010

N
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0 250 500 750 1,000
Meters

A3 Scale: 1:20,000

File:BrokenHdQuarry_Fig7d_Elevation_2km_200923 Date: 16/10/2020

Broken Head Quarry

Figure 12

Contours

BUSHFIRE PLANNING AUSTRALIA

The Subject Site
100m Buffer
140m Buffer
Contour (10m)
Contour (2m)
Watercourse

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 08/09/19
Surface analysis: Derived from ByronBay2010_5566824_56_0002_0002_1m: © Department Finance, Services and Innovation 2010

N
W E
S

0 50 100 150 200
Meters

A3 Scale: 1:4,000

File:BrokenHdQuarry_Fig12_Contours_201113 Date: 13/11/2020

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Broken Head Quarry

Figure 13

Contours - 2km buffer

BUSHFIRE PLANNING AUSTRALIA

The Subject Site
2km Buffer
Contour (20m)
Contour (5m)

SOURCE:
Surface analysis: Derived from ByronBay2010_5566824_56_0002_0002_1m: © Department Finance, Services and Innovation 2010

N
W E
S

0 250 500 750 1,000
Meters

A3 Scale: 1:20,000

File:BrokenHdQuarry_Fig7c_Contours_2km_200923 Date: 16/10/2020

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Broken Head Quarry

Figure 14

Slope Analysis - LiDAR

BUSHFIRE PLANNING AUSTRALIA

- The Subject Site
- 100m Buffer
- 140m Buffer
- Contour (10m)
- Contour (5m)
- Watercourse

Slope

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

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 08/09/19
Surface analysis: Derived from ByronBay2010_5566824_56_0002_0002_1m: © Department Finance, Services and Innovation 2010

N W E S

0 50 100 150 200
Meters

A3 Scale: 1:4,000

File:BrokenHdQuarry_Fig8b_SlopeLiDAR_200923 Date: 16/10/2020

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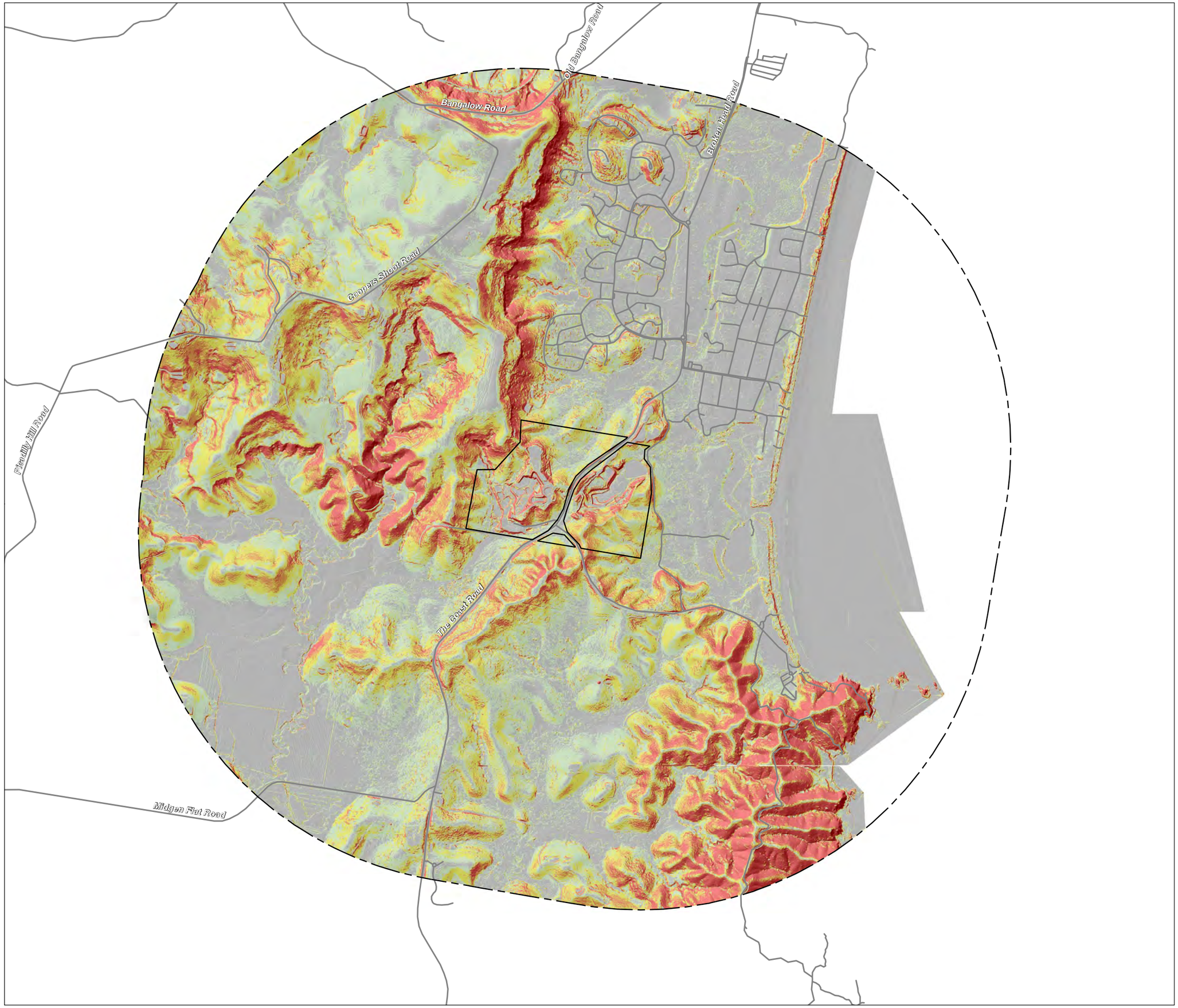

Broken Head Quarry

Figure 15

Slope Analysis - LiDAR

BUSHFIRE PLANNING AUSTRALIA

The Subject Site

2km Buffer

Slope

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

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Surface analysis: Derived from ByronBay2010_5566824_56_0002_0002_1m: © Department Finance, Services and Innovation 2010

N
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0 250 500 750 1,000
Meters

A3 Scale: 1:20,000

File:BrokenHdQuarry_Fig8c_SlopeLiDAR_2km_200923 Date: 16/10/2020

3.3. Results

Vegetation communities have been plotted for a distance of 2km based on Byron Shire Council's vegetation communities mapping and some ground truthing carried out on and around the development site. The vegetation is a mix of communities which are typical around the NSW North-East coast.

Immediately adjoining the site is an area of North Coast Dry Sclerophyll Forest (DSF) which surrounds the site but also extends to the south of site across an area of approximately 1km^2. The North Coast DSF has a shrubby sub-formation with prominent layers of sclerophyll shrubs and an open eucalypt canopy with tree heights of up to 25m (Keith, 2004). There is a slightly higher cover of grasses than the neighbouring Coastal Dune DSF, which suggests a slightly higher overall fuel load. Council's High Environmental Value Vegetation mapping shows small pockets of this Coastal Dune DSF to the east and north east of the site.

Beyond the North Coast DSF to the south is an area of North Coast Wet Sclerophyll Forest (WSF), again not larger than approximately 1km^2. The continuity of the WSF is split in a north-south direction by Broken Head Road and by rural residential land holdings. North Coast WSF typically has a dense shrub formation of an open layer which typically grows up to 15m tall and a second layer of elevated shrub fuel, with a continuous ground stratum of ferns and herbs and a eucalypt height of 30-60m (Keith, 2004). The fuel loading of these small areas of WSF is much higher than the DSF.

To the east of the quarry beyond the North Coast DSF lies an area of Wallum Sand Heath, which is a tall heath of over 2m in height and Coastal Heath Swamps, which is a short heath less than 2m in height. To the west of the quarry is a strip of Subtropical Rainforest, which has a multi-layered tree canopy up to 20-40m in height. The fuel load of a rainforest is typically the lowest of the forest communities due to its moisture content. Beyond the rainforest communities there are large rural residential land holdings which are mostly grassed areas with pockets of forest and rainforest communities.

The ground truthing survey has also shown a few patches of Coastal Swamp Forest which is very typical of the east coast location of the development site. The Coastal Swamp Forest has such a dense canopy that the shrub understorey beneath the canopy is limited in its development (Keith, 2004), meaning that its fuel load is lower than the overall fuel load for the forest category it sits in within PBP 2019. The vegetation class and effective slope in all directions is shown in **Figure 16** and **Table 2.**

Vegetation on site, within the area subject to the rezoning has been cleared during the operation of the former quarry. Since operation of the quarry ceased, a rehabilitation and revegetation program has commenced which has seen extensive replanting throughout both quarries. The majority of plants are still quite juvenile and are likely to require regular maintenance in the short term to ensure the revegetation program is successful.

The overall landscape assessment is that the highest fuel loads are situated to the south and south east of the quarry site in the DSF, WSF and *tall heath*. These fuel loads are punctuated by Broken Head Quarry Road and the rural residential communities of Broken Head. The fuel loads to the north of the site are also relatively high. The lowest fuel loads are to the west of the quarry site where much of the land is occupied by large residential land holdings with grassed grounds and clumps of *rainforest* and *forest* communities which lead into the *rainforest* to the immediate west of the site.

Table 2: Slope and Vegetation Assessment Results

Transect	Vegetation Description	Vegetation Classification (PBP 2019)	Slope
T1	Non-hazard, low-threat vegetation, or managed land *BOS site*	**Rainforest**	-10.6° Upslope
T2	Partially cleared forest; managed understorey *BOS site*	**Rainforest**	-9.2° Upslope
T3	Partially cleared forest; managed understorey, fire trail *BOS site*	**Rainforest**	-3.4° Upslope
T4	Partially cleared forest; managed understorey, fire trail *BOS site*	**Rainforest**	-0.2° Upslope
T5	Partially cleared forest/ remnant forest Bushfire affected	**Rainforest**	5.1° Downslope
T6	Remnant vegetation – bushfire affected	**Forest (North Coast DSF)**	9.8° Downslope
T7	Remnant vegetation – bushfire affected	**Forest (North Coast DSF)**	12.4° Downslope
T8	Remnant vegetation – bushfire affected	**Forest (North Coast DSF)**	11.8° Downslope
T9	Remnant vegetation – bushfire affected	**Forest (North Coast DSF)**	11.5° Downslope
T10	Remnant vegetation – bushfire affected	**Forest (North Coast DSF)**	8.8° Downslope
T11	Non-hazard, low-threat vegetation, grazing land, or managed land *Temporary APZ*	**Forest (North Coast DSF)**	-10.1° Upslope
T12	Non-hazard, low-threat vegetation, grazing land, or managed land *Temporary APZ*	**Forest (North Coast DSF)**	-7.0° Upslope
T13	Non-hazard, low-threat vegetation, grazing land, or managed land	**Forest (Coastal Swamp Forest)**	3.1° Downslope
T14	Non-hazard, low-threat vegetation, grazing land, or managed land *Temporary APZ*	**Forest (North Coast DSF)**	4.1° Downslope
T15	Non-hazard, low-threat vegetation, estuary/ saline wetland, riparian zone	**Forest (North Coast DSF)**	-4.1° Upslope
T16	Non-hazard, low-threat vegetation, grazing land, or managed land	**Tall Heath (Wallam Sand Heath)**	-0.1° Upslope
T17	Non-hazard, low-threat vegetation, estuary/ saline wetland, riparian zone	**Tall Heath (Wallam Sand Heath)**	1.2° Downslope

Transect	Vegetation Description	Vegetation Classification (PBP 2019)	Slope
T18	Non-hazard, low-threat vegetation, estuary/ saline wetland, riparian zone	**Forest (North Coast DSF)**	8.3° Downslope
T19	Non-hazard, low-threat vegetation, grazing land, or managed land	**Forest (North Coast DSF)**	9.3° Downslope
T20	Non-hazard, low-threat vegetation, grazing land, or managed land *Temporary APZ*	**Forest (North Coast DSF)**	-0.3° Upslope
T21	Non-hazard, low-threat vegetation, estuary/ saline wetland, riparian zone	**Shorth Heath (Coastal Heath Swamps)**	0.3° Downslope
T22	Non-hazard, low-threat vegetation, grazing land, or managed land	**Tall Heath (Wallam Sand Heath)**	6.4° Downslope
T23	Non-hazard, low-threat vegetation, estuary/ saline wetland, riparian zone	**Forest (North Coast DSF)**	3.3° Downslope
T24	Non-hazard, low-threat vegetation, estuary/ saline wetland, riparian zone	**Rainforest**	-6.4° Upslope
T25	Non-hazard, low-threat vegetation, grazing land, or managed land	**Rainforest**	-3.4° Upslope
T26	Non-hazard, low-threat vegetation, grazing land, or managed land *Temporary APZ*	**Rainforest**	-0.1° Upslope

Broken Head Quarry

Figure 16

Slope and Hazard Assessment

BUSHFIRE PLANNING AUSTRALIA

- The Subject Site
- 100m Buffer
- 140m Buffer
- Contour (10m)
- Contour (2m)
- Watercourse
- RL
- Transect
- Forest (North Coast Dry Sclerophyll Forest)
- Regrowth Forest (North Coast Dry Sclerophyll Forest)
- Forested Wetland (Coastal Swamp Forest)
- Rainforest
- Short Heath (Coastal Heath Swamps)
- Tall Heath (Wallum Sand Heath)
- Water

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 08/09/19
Surface analysis: Derived from ByronBay2010_5566824_56_0002_0002_1m: © Department Finance, Services and Innovation 2010
Vegetation: JWA Ecological Consultants 2020 (modified by BPA June 2020)
Zoning: Department of Planning, Industry and Environment 2020

N W E S

0 50 100 150 200
Meters

A3 Scale: 1:4,000

File:BrokenHdQuarry_Fig8_SlopeHazard_200923 Date: 16/10/2020

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3.4. Significant Environmental Features

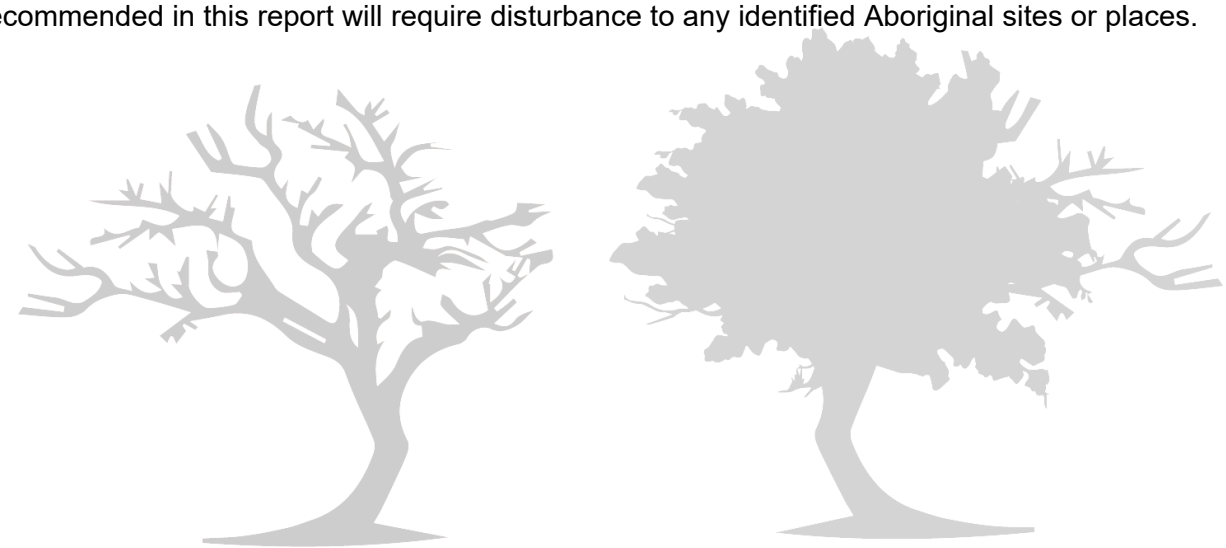
It is expected further biodiversity investigations will be undertaken to identify and assess the potential impacts on any significant environmental features. Should any of the recommended bushfire protection measures have an unacceptable impact on a significant environmental feature, consultation with the project ecologist and the relevant stakeholders will be carried out to negotiate an acceptable outcome.

3.5. Threatened Species, populations or ecological communities

The area of the site to be affected by the proposed development has been identified to avoid impact on any threatened species, population or EEC; being the area within the site disturbed from the historical quarrying activities. All bushfire mitigation measures; including APZs will consider the existing and potential biodiversity values to avoid impact where possible.

3.6. Aboriginal Objects

A search of the AHIMS database (results contained in **Appendix B**) revealed there are no Aboriginal sites or places recorded within the development footprint that would be affected by the recommended bushfire mitigation measures. It is noted an Aboriginal Place is located directly to the east of the site; known as Ti Tree (Taylors) Lake. It is not expected that any bushfire mitigation measures recommended in this report will require disturbance to any identified Aboriginal sites or places.



4. Bushfire Strategic Study

As this site is identified for a new rural residential development, the strategic principles in PBP 2019 must be addressed. This bushfire strategic study aims to assess the macro-scale bushfire context for new residential development on the site. It will create a risk profile for new development and assess the appropriateness of the proposed land uses in this area. The study will also look at the emergency response profile for the site, including the road network.

The Land Use Planning for Disaster Resilient Communities published in 2020 by the Australian Institute for Disaster Resilience focusses on reducing disaster risk by improving strategic planning processes. The focus is on reducing both vulnerability and exposure of commnunities to natural hazard scenarios. This SBS seeks to assess and respond to the vulnerability and exposure of the proposed community by establishing the strategic bush fire planning context of the development site. The SBS incorporates a climate change factor into the risk assessment process with a view to build resilience into the resultant development.

The bushfire strategic study responds to the principles within the National Emergency Risk Assessment Guidelines of establishing the context and then assessing the risk. The risk assessment process follows the following process:

- Risk identification
- Risk analysis
- Risk evaluation
- Risk treatment

To undertake this risk assesment, the issues identified within Table 4.2.1 of PBP 2019 will be addressed. A determination will be made as to whether the resultant bushfire protection measures for subdivisions in PBP 2019 are the appropriate measures to mitigate the identified risk. Key to the risk profiling of the site is a landscape scale assessment of vegetation communities, the exposure and vulnerability of proposed land uses and an evaluation of the evacuation options available.

4.1. Bushfire Landscape Assessment

A bushfire landscape assessment is required by PBP 2019 to consider the likelihood of a bushfire approaching the site and the potential impact on life and property in the context of the broader surrounding landscape.

Fire behaviour has been assessed on a 2-kilometre scale. This distance is considered a reasonable scale by which to assess fire behaviour within the landscape for this particular site. It is a large enough distance to assess the variation in vegetation and the predominant vegetation class. It is also a large enough distance to assess the topographic conditions which may affect the behaviour of a bushfire approaching the site. **Figure 17** below shows a visual representation of the landscape assessment.

4.1.1. Vegetation

Vegetation communities have been plotted for a distance of 2km based on Byron Shire Council's vegetation communities mapping and some ground truthing carried out on and around the development site. The vegetation is a mix of communities which are typical around the NSW North-East coast.

Immediately adjoining the site is an area of North Coast Dry Sclerophyll Forest (DSF) which surrounds the site but also extends to the south of site across an area of approximately 1km^2. The North Coast DSF has a shrubby sub-formation with prominent layers of sclerophyll shrubs and an open eucalypt canopy with tree heights of up to 25m (Keith, 2004). There is a slightly higher cover of grasses than the neighbouring Coastal Dune DSF, which suggests a slightly higher overall fuel

load. Council's High Environmental Value Vegetation mapping shows small pockets of this Coastal Dune DSF to the east and north east of the site.

Beyond the North Coast DSF to the south is an area of North Coast Wet Sclerophyll Forest (WSF), again not larger than approximately 1km^2. The continuity of the WSF is split in a north-south direction by Broken Head Road and by rural residential land holdings. North Coast WSF typically has a dense shrub formation of an open layer which typically grows up to 15m tall and a second layer of elevated shrub fuel, with a continuous ground stratum of ferns and herbs and a eucalypt height of 30-60m (Keith, 2004). The fuel loading of these small areas of WSF is much higher than the DSF.

To the east of the quarry beyond the North Coast DSF lies an area of Wallum Sand Heath, which is a tall heath of over 2m in height and Coastal Heath Swamps, which is a *short heath* less than 2m in height. To the west of the quarry is a strip of Subtropical Rainforest, which has a multi-layered tree canopy up to 20-40m in height. The fuel load of a *rainforest* is typically the lowest of the forest communities due to its moisture content. Beyond the *rainforest* communities there are large rural residential land holdings which are mostly grassed areas with pockets of *forest* and *rainforest* communities.

The ground truthing survey has also shown a few patches of Coastal Swamp Forest which is very typical of the east coast location of the development site. The Coastal Swamp Forest has such a dense canopy that the shrub understorey beneath the canopy is limited in its development (Keith, 2004), meaning that its fuel load is lower than the overall fuel load for the *forest* category it sits in within PBP 2019.

Vegetation on site, within the area subject to the rezoning has been cleared during the operation of the former quarry. Since operation of the quarry ceased, a rehabilitation and revegetation program has commenced which has seen extensive replanting throughout both quarries.

Through the proposed residential development, there is likely to be a natural regrowth of some of the cleared vegetation. The regrowth of vegetation and retention of vegetation on site must be dealt with through a vegetation plan of management to ensure that future residential development is not subject to a higher risk than that assessed within this SBS. It is particularly important to ensure that no corridors of vegetation are included within future residential development which might carry a bushfire from surrounding vegetation into the site itself.

The overall landscape assessment is that the highest fuel loads are situated to the south and south east of the quarry site in the DSF, WSF and *tall heath*. These fuel loads are punctuated by Broken Head Quarry Road and the rural residential communities of Broken Head. The fuel loads to the north of the site are also relatively high. The lowest fuel loads are to the west of the quarry site where much of the land is occupied by large residential land holdings with grassed grounds and clumps of *rainforest* and *forest* communities which lead into the *rainforest* to the immediate west of the site.

Broken Head Quarry

Figure 17

High Environmental Value Vegetation

BUSHFIRE PLANNING AUSTRALIA

- The Subject Site
- 2km Buffer
- Coastal Floodplain Wetlands
- Saltmarshes
- Wallum Sand Heaths
- Coastal Dune Dry Sclerophyll Forests
- Coastal Heath Swamps
- North Coast Dry Sclerophyll Forests
- Coastal Swamp Forests
- North Coast Wet Sclerophyll Forests
- Subtropical Rainforests
- Coastal Freshwater Lagoons
- Littoral Rainforests

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: Maxar 2019
High Environmental Value Vegetation: Byron Shire Council 2016

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0 250 500 750 1,000
Meters

A3 Scale: 1:20,000

File:BrokenHdQuarry_Fig6d_VegetationHEV_2km_200923 Date: 16/10/2020

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4.1.2. Topography

The topography of the land surrounding the site is best described as undulating. Slopes have been assessed in detail to 140m surrounding the site and there are no slopes steeper than approximately 12°. The Slope Analysis LiDAR (**Figures 14** and **15**) shows various slopes surrounding the site, the steepest of which to the south and north-west of the quarry. Given that the topography is a series of valleys and higher areas, the rate of spread of any bushfire approaching the site would vary but would not be under steep slope conditions. To the south of the eastern portion of the quarry, a bushfire approaching from the south would be travelling cross-slope to arrive at the site, which would reduce its rate of spread.

4.1.3. Weather

The site is situated within the Far North Coast NSW RFS weather district and the Bureau of Meteorology's North Coast Forecast Area. The Far North Coast NSW RFS weather district is given a Fire Danger Index (FDI) of 80, a lower FDI than the Greater Sydney and South Coast areas of NSW. The FDI of 80 takes into consideration the difference in the seasons in the North of the State. The fire danger period in the North begins earlier in the season on 1 August and is ordinarily over by the end of the year. This is because of the building levels of humidity in the North of the State which make it harder for bushfires to burn.

On the East coast of Australia, the hottest fires approach from the West or North West under strong winds. The Westerly aspect is therefore the most high-risk aspect, however fires can approach from any direction. Due to the limited vegetation between the site and the coast line, a fire from the east is possible but unlikely to cause damage due to being fuelled by a colder, more moist breeze from the ocean and because there is not enough vegetation in this direction for a fire to become fully developed prior to reaching the site.

A fire from the south is possible. If a fire ignites in the vegetation to the south, it would be fuelled by southerly winds which tend to be colder. The rate of spread would therefore be limited. A fire which has originated to the south west and been fuelled by westerly winds and then subject to a southerly wind change would be the most dangerous scenario from a southerly direction. History has shown that these fires catch firefighters by surprise and can be difficult to suppress. A fire from the North is also possible under a Northerly or North Easterly wind, but would be slowed by the community of Suffolk Park to the north of the site.

If we were to incorporate a climate change factor into the strategic assessment, we can look for numerical weather data or carry out a merit-based assessment, or utilise both strategies.

"Australia will get hotter; in all regions maximum and minimum temperatures in all seasons are expected to increase 0.2 to 2.2°C by 2030, and 0.4 to 6.7°C by 2070" (Dunlop, M., & Brown, P.R. 2008). There is not as much data on rainfall, but it is expected that northern NSW is likely to experience slightly greater rainfall, mostly in the summer and autumn seasons. The increased rainfall could lead to increased plant growth and fuel load.

It is difficult to say what all this may mean for vegetation communities in the future and how far into the future vegetation may change. However, on the basis of the evidence produced by Dunlop and Brown, it is possible that fuel loads will increase and there may be some drying of vegetation, such that *rainforest* vegetation may increase in flammability.

Some work has been done to incorporate a climate change factor into FDI figures. The research has shown that, in general the FDIs we are currently using may be considered to be low. In the Casino and Grafton areas, which are the weather stations closest to the site, studies have shown that the FDI of 80 used in the northern parts of the State underestimates the potential impact of bushfire. An FDI of 100 is considered to be a better policy setting for these areas (Douglas, G 2017).

Utilising this evidence presented, it is fair to also consider the use of an FDI of 100 to assess compliance with PBP 2019. It is also wise to include an assumption in the assessment of fire behaviour in the landscape that future vegetation communities may be drier and fuel loads higher.

Incorporating these factors into the assessment will adopt a level of caution following the precautionary principle.

4.1.4. Bushfire history

Across the Far North Coast BFMC area, fire agencies attend an average of approximately 460 bush, grass and/or scrub fires per year. The main sources of ignition in the Far North Coast BFMC area are fire escape from legal or illegal fires (mainly prior to the introduction of the bush fire danger period), arson, and lightning strikes.

Section 2.2 above stated that there is no history of bushfire at the site itself and minor fire history in areas surrounding the site. There have been more major fires to the south of the site at Lennox Head, to the north at Byron Bay and further north around Belongil Beach. A series of maps of the fire history in relation to the site's location is provided in **Figure 5**.

There is limited data available regarding the other fires shown on the fire history map, suffice to say that there has not been an event which threatens the site's location.

4.1.5. Overall landscape assessment

The highest fire risk aspects are the westerly and southerly aspects of the site. Due to the rural landholdings and broken *forest* vegetation to the west, leading into *rainforest* vegetation as it approaches the site, a fire originating to the west of the site would slow down. The rate of spread of the fire would weaken as it approaches the site. Even incorporating the climate change assessment that the *rainforest* vegetation may be drier in years to come, there is no clear corridor of continuous forested vegetation to the west to assume anything more than high fire danger.

Vegetation to the south is more dense forested vegetation carrying a higher fuel load. If the North of the State experiences higher rainfall prior to the bushfire season and the fuel loads increase, we should assume as a worst case that the current fuel loads may be higher. The land is undulating and no steeper slopes have been recorded. Nonetheless, given the fuel loadings, we should assume that the highest bushfire risk comes from the south under a wind change scenario. It is worth noting that the vegetation to the south is fragmented by Broken Head Road and the rural residential landholdings in Broken Head. This would have the effect of slowing the rate of spread of any fire approaching the site from this direction. The topography closest to the eastern side of the site also shows that any fire would approach on a cross-slope which would not be as fast moving as if it was travelling upslope.

4.2. Land Use Assessment

The planning proposal is to rezone the site to R2 residential low-density use. A subdivision plan prepared by EMM in 2014 proposed 11.82ha of residential development, along with 7.35ha of local open space and 33.15ha of environmental conservation. The proposal included 42 low density residential lots between 2,000 and 6,000m^2. It is likely that any future development of the land will follow a similar development pattern to that proposed.

The BAL contour plan show that the required asset protection zones (APZ) for residential uses under PBP 2019 can be provided by the development. For future subdivision, the development needs to show that all lots created with a residential entitlement can provide an APZ which is commensurate with a radiant heat level greater than 29kW/m^2. This would also mean that future dwellings would not have a Bushfire Attack Level (BAL) greater than BAL-29. The BAL contour plan shows that at an FDI of 80, which is currently required by PBP 2019 for this location, future lots can comply. It is likely that if an FDI of 100 was adopted to represent future state under a climate change scenario, the lots will still be able to comply with PBP 2019, insofar as future dwellings not being exposed to radiant heat levels greater than 29kW/m^2.

As large residential lots, there is also an ability for dwellings to be built at the lowest possible BAL and as far away from hazardous vegetation as possible. Moving the building footprint to the lowest risk area of each allotment is a positive strategy to create the most resilient community possible. This strategy can be reinforced through a resultant structure plan or DCP for the site and through the sales and marketing campaigns for the lots.

A future subdivision would need to provide a perimeter road 8m wide around the development (parking to provide outside the 8m carriageway). The 2014 subdivision plan illustrates that this is entirely possible within the lot boundaries. The perimeter road provides a hardstand APZ which will never be overgrown so constitutes managed land. The hardstand APZ provides an effective fire break, slowing the spread of a fire towards the development and also provides a platform for response from emergency services.

Based on the landscape assessment, the areas of the site subject to the highest bushfire risk profile are the south and west. The risk is reduced somewhat by the way in which the vegetation is fragmented by surrounding residential land uses, which would have the impact of slowing the rate of spread of an approaching fire.

Any vegetation retained within the site boundaries will need to be managed to ensure there is no increase in the bushfire risk over and above what has been taken into consideration in this assessment. A Plan of Management will need to be prepared for any land which is retained for local open space or environmental conservation. The Plan of Management will need to detail who will be responsible for the maintenance of any on-site vegetation and will need to outline a management regime as necessary to ensure there is no fire path created into the site.

Taking all of the above into consideration, the site is considered to be appropriate for the proposed low-density residential development.

4.3. Access and Egress

Access and egress to the site will need to be appropriate for both emergency services attending and residents evacuating and will need to meet the requirements of PBP 2019.

The site takes its main access from Broken Head Road and as the 2014 subdivision plan shows, a perimeter road can be provided around the entirety of the new development. The perimeter road would be 8m wide as per the requirements of PBP 2019 and would enable two-way access via a through road for residents to evacuate whilst emergency services are responding. All future lots would therefore have direct access to a public through road in compliance with PBP 2019.

The proposed junction onto Broken Head Road is a key juncture and needs to be appropriately engineered so that traffic can flow freely, even under emergency conditions. Broken Head Road itself is a classified Main Road, number 545 and is a regionally important. Regional Roads perform an intermediate function between the main arterial network of State Roads and council controlled Local Roads, they are managed by council with financial assistance from State Government (NSW Roads and Maritime Services, 2017).

The landscape assessment shows that a bushfire is most likely to approach from either the west or south of the site, with the highest bushfire risk being from the south. The likely direction of travel in evacuation is therefore to the north of the proposed development towards the settlements of Suffolk Park and Byron Bay. Suffolk Park is approximately 1.5km north along Broken Head Road, taking approximately 2 minutes to travel. Byron Bay is approximately 4.7km to the north, taking approximately 6 minutes to travel. There are facilities in both of these settlements which could be used for shelter.

There may be other people heading north on Broken Head Road from the small rural communities to the south of the site. An additional 40-60 traffic movements are anticipated from the proposed development, assuming that at least 80% of residents follow the advice to leave when a bushfire approaches the site. It is not expected that these additional traffic movements would result in traffic congestion on Broken Head Road.

A secondary access which provides an alternative route for residents evacuating and/or emergency services attending is recommended. For residents evacuating, the secondary access would need to be realistic evacuation route which provides an alternate egress onto Broken Head Road. The likely direction of travel is north towards the communities of Suffolk Park and Byron Bay. Investigations into the provision of this alternate access/egress should be carried out and can include utilising the existing fire trail access routes around the site. Solutions which provide alternative egress for

residents evacuating, whilst providing unrestricted access for emergency services attending is recommended.

There is a Neighbourhood Safer Place (NSP) just north of Suffolk Park at Byron Bay Golf Club on Broken Head Road, which is approximately 3km or a 4 minute drive north of the site. A further NSP is located at Byron Bay Surf Lifesaving Club on Bay Street in Bryon Bay, approximately 7km or 10 minute drive from the site. A NSP is a place of last resort so cannot be relied on in the event of a bushfire but if there is a need for a place of shelter, having two NSP within driving distance is positive.

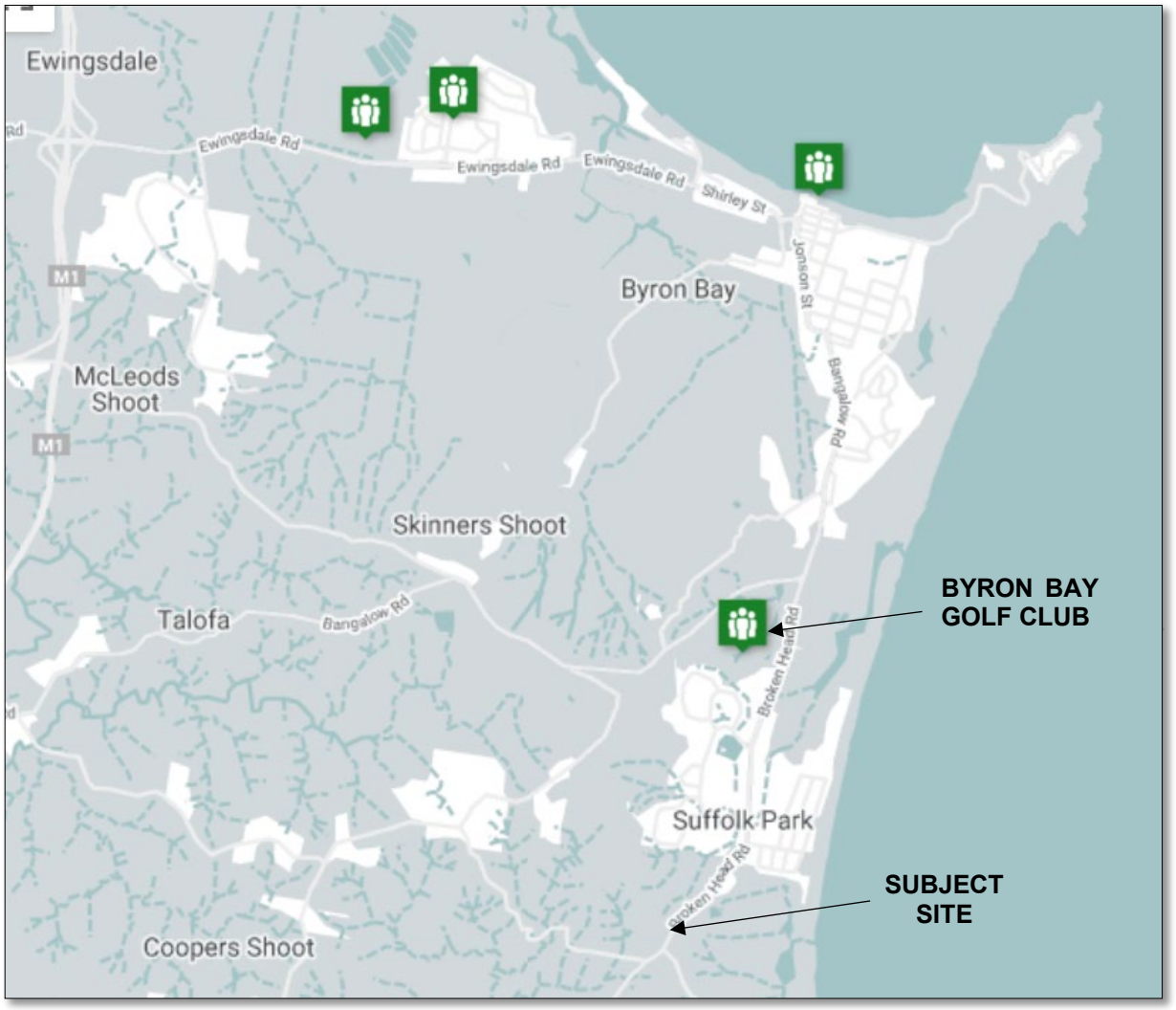

Figure 18: Neighbourhood Safer Place (NSW RFS)

4.4. Emergency Services

There is a NSW Fire & Rescue Station at Kingsley Street in Byron Bay, approximately 6km or 9 minutes drive away from the site. Any local bushfire events would be controlled by the NSW RFS Far North Coast Fire Control Centre at 70-90 Station Street, Mullumbimby. Fire suppression would be undertaken by local NSW RFS brigades, supported by NSW Fire & Rescue. The nearest NSW RFS Brigade is located at Suffolk Park, approximately 1.7km drive from the quarry site.

There would be an increase in demand for emergency services in responding to the proposed community so it is recommended that liaison takes place with the Local Emergency Management Committee (LEMC) to ensure that they have an understanding of the proposed additional community and its emergency response requirements.

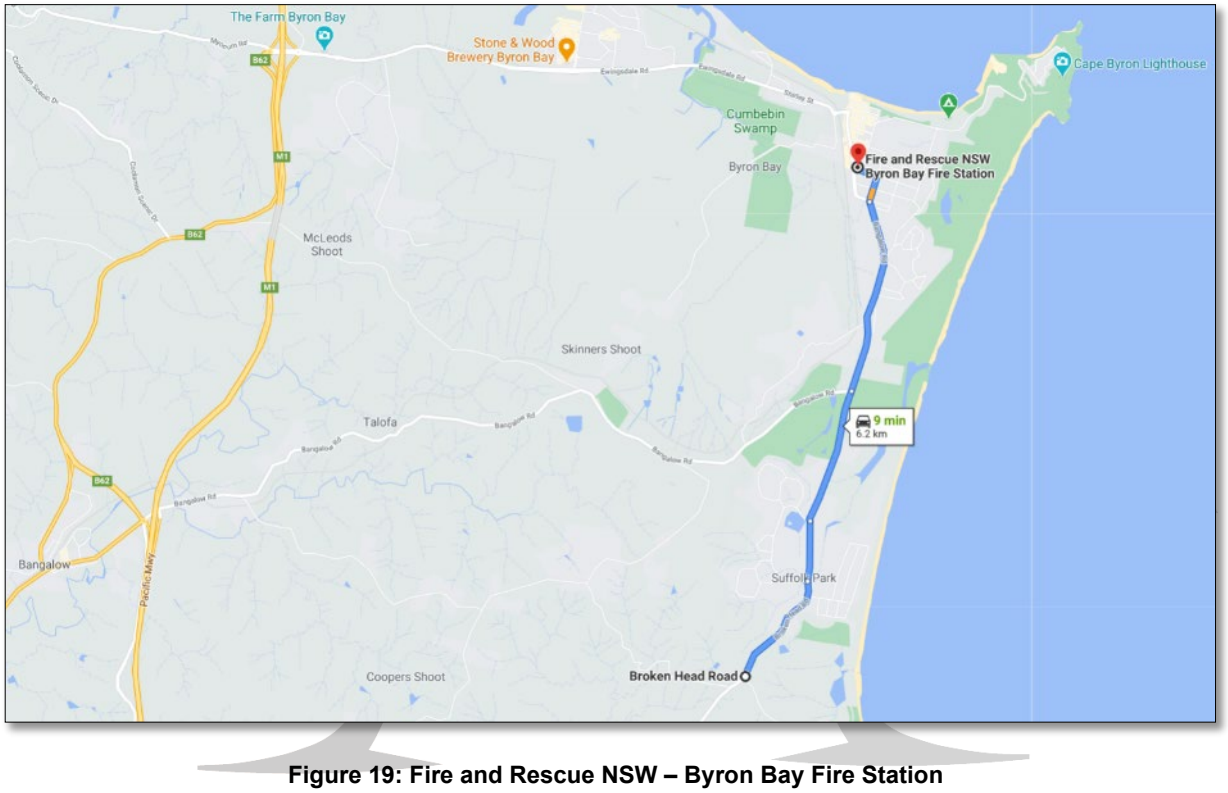

Figure 19: Fire and Rescue NSW – Byron Bay Fire Station

4.5. Infrastructure

Electricity supply to the proposed residential community will be underground and therefore posing no threat to life or occupants. Future residential development applications will be able to meet the acceptable solutions and performance criteria of PBP 2019, ensuring that the location and design of gas and electricity services does not lead to ignition of surrounding bushland or the fabric of buildings.

A water supply connection will be taken from the reticulated town supply. This supply will be required to meet the acceptable solutions and performance criteria of PBP 2019. Given the nature of the bushfire risk identified by the landscape assessment, it is recommended that future residential lots also have a static water supply available for firefighting purposes. This additional water supply should be 5,000 litres per lot. Although the lots are larger residential lots, 5,000L is considered a large enough volume in addition to the reticulated supply. The lots will all be of a size which allows for this static supply. All static water supplies should be easily accessible and include firefighting connections in accordance with PBP 2019.

4.6. Adjoining Land

The Bush Fire Risk Management Plan (BFRMP) in place for the site's location is the Far North Coast BFRMP. The BFRMP identifies assets at risk and sets out a five-year mitigation program.

The Ballina/Byron/Tweed area is a popular tourist destination. Many of the surrounding land uses are tourism related and the population swells with the influx of visitors during the summer season. Emergency response needs to take into consideration the unpredictability of tourists and plan evacuations carefully.

The area is also characterised by a number of rural communities spread throughout the hinterland. Many rural communities in this area are multiple occupancies which are of particular concern due to lack of water supply, APZ management and access.

The proposed land use does not pose any further threat to adjoining land uses than already exists. Given the low-density nature of the proposed development, there would not be significant additional pressure on local emergency services.

The land adjacent to the site to the south east is a Land Management Zone (LMZ) as shown by the light green hatched area in **Figure 20**. The LMZ is a zone within which the land is managed as per the land management and fire protection objectives of the responsible agency to reduce the likelihood of spread of fires, most likely using a mosaic burning pattern.

If we were to undertake an assessment of the residential use of the site under the BFRMP Guidelines (NSW RFS), the asset type would be a Human settlement. We would then need to assess the likelihood of a fire occurring and the consequence if a fire occurred to determine the level of bush fire risk.

Utilising the fire history assessment carried out, the likelihood of a fire occurring is considered 'Possible'. There have been few ignitions in this area, which have not occurred on a frequent basis. The possibility of any fire which occurs spreading and reaching assets is mitigated through compliance with PBP 2019 and the other measures recommended within this SBS. The need for a vegetation management plan for any regrowth within the site and avoidance of any corridors which might create a fire path will limit the ability of fire to carry towards assets.

Following the landscape assessment given above, the threat level is determined to be 'High'. This level has been derived using the following assessment. The vegetation category with the highest fuel load in proximity to this site is *forest.* The slopes in proximity to the site are moderate. The separation distance provided by compliance with PBP 2019 will provide moderate-good separation from the hazard.

The vulnerability for the site is considered to be 'Low vulnerability'. The properties resulting from the proposal will be subject to conditions of development consent to be prepared, including maintenance of APZ. The proposal will only go ahead if the access and egress to the site is engineered to meet an adequate level. Should the development proceed without adequate access and egress in line with PBP 2019 and this SBS, the development would be subject to 'High vulnerability', which would not be appropriate. The water supply will be adequate and all new homes will be required to meet the current construction standards for building in bush fire areas (AS3959).

Any future development will need to ensure that community education programs are provided to ensure that residents understand their responsibility to keep properties well maintained and understand ways in which to defend their own property.

Taking into account the 'High' threat level and 'Low' vulnerability level, the consequence rating derived at for the site is 'moderate'. With a 'moderate' consequence rating and a 'possible' likelihood rating, the development has a 'medium' level of bush fire risk. Under the BFRMP Guidelines, this risk rating results in 'action may not be required'.

This level is considered appropriate for new development, given that mechanisms can be put in place through development consent to allow for increased bushfire protection through increased APZs,

education programs and improved water supply. These mechanisms should negate the need for further mitigation treatment into the future.

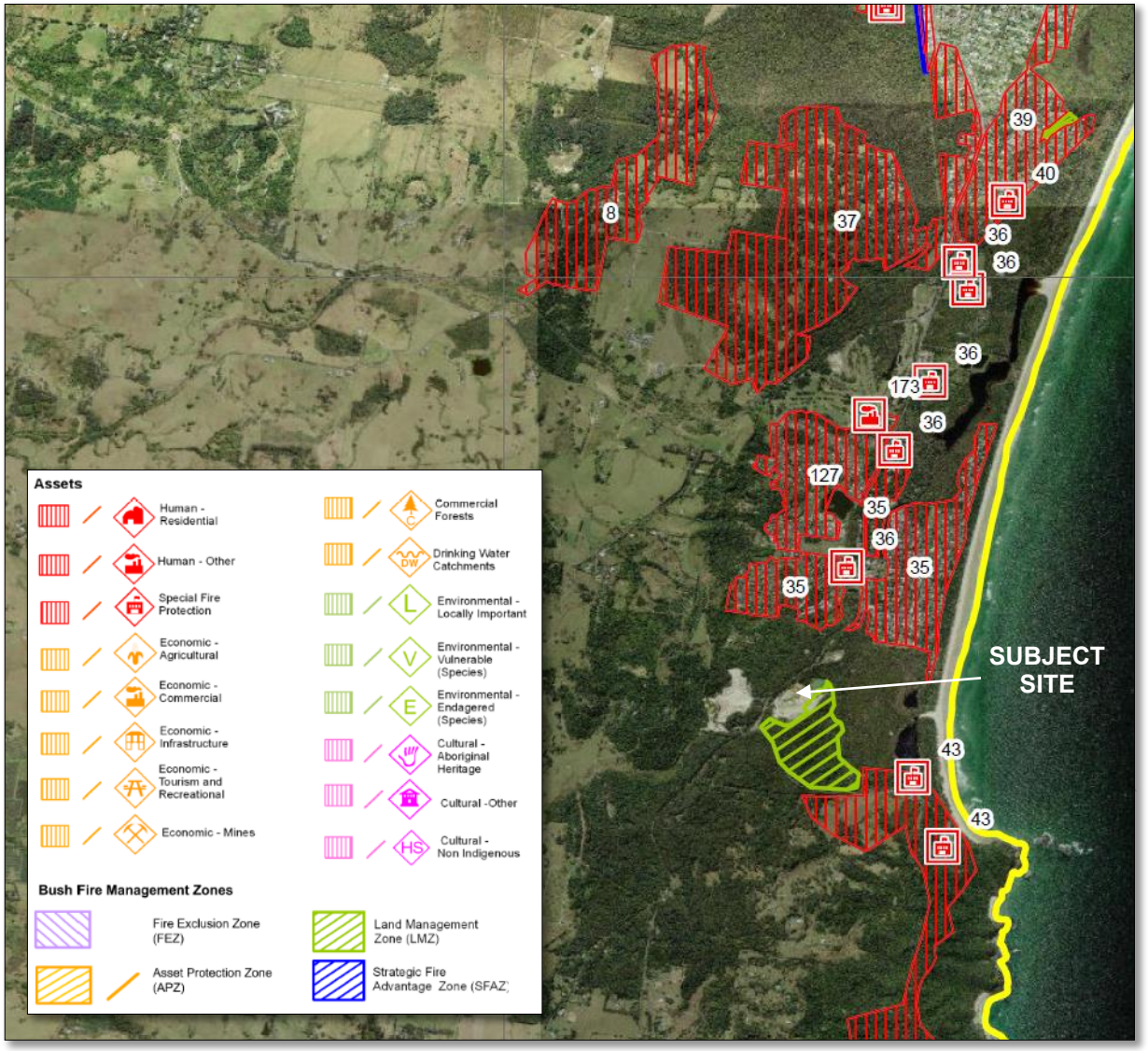

Figure 20: Far North Coast BFRMP 2017

4.7. Strategic bushfire study conclusions

The landscape, vegetation and topographic studies show that this site is subject to a high bushfire threat which can be mitigated through compliance with PBP 2019 and additional measures which are outlined below. Although the threat is high, it has been concluded that the vegetation composition and fragmented nature would have the effect of slowing the rate of spread of any bushfire on approach to the site.

Following the NSW RFS BFRMP Guidelines, the proposed development receives a 'Medium' risk rating. This risk rating is dependent upon access and egress to the site being provided in accordance with PBP 2019, ensuring safe movement into and away from the site by residents and emergency services during a bush fire event. This is significant because if adequate access and safe movement cannot be achieved, the risk rating would jump to 'Very High' and the development would require action to mitigate this risk into the future.

Subject to the following recommendations, the land use is considered to be appropriate:

- ❑ Future asset protection zones are based on an FDI of 100 to incorporate a climate change factor into bushfire protection;

- Asset protection zones will be fully contained within future lot boundaries and will not rely on adjoining land;
- The capacity of the road network must be sufficient to deal with the proposed new community in an emergency situation; this will include provision of road upgrades to the junction with Broken Head Road to enable free traffic movement in the event of an emergency;
- An alternative access is recommended for residents evacuating and emergency services attending, potentially utilising existing access tracks around the site;
- Despite the connection to a reticulated water system, an additional static water supply of 5,000L per lot is recommended; and
- Details of the proposed community should be provided to the LEMC to enable awareness in emergency response.
- Targeted community education programs to be held on an ongoing basis for the proposed community.
- A vegetation plan of management should be prepared to ensure that the regrowth of vegetation on site does not create corridors which can carry fire from the vegetation surrounding the site towards assets on site.

5. Bushfire Risk and Mitigation

5.1. Asset Protection Zones – Acceptable Solution

An APZ is an area surrounding a development that is managed to reduce the bushfire hazard to an acceptable level to mitigate the risk to life and property. The required width of the APZ varies with slope and the type of hazard. An APZ can consist of both an inner protection area (IPA) and an outer protection area (OPA). In this instance the entire APZ and the balance of the development site shall be managed as an IPA.

5.1.1. Determining the Appropriate Setbacks

To achieve compliance with the performance criteria for APZs (Table 5.3a), development is able to provide the required APZs outlined in Table A1.12.2 of PBP 2019.

Refer to **Table 3** for the recommended APZs.

Table 3: Required and Recommended Asset Protection Zones

Transect	Vegetation Classification (PBP 2019)	Slope Class	PBP 2019 FDI 80 Table A1.12.3	PBP 2019 FDI 100 Table A1.12.2
T1	**Rainforest**	<0° Upslope	**9m**	11m
T2	**Forest (North Coast DSF)**	<0° Upslope	**20m**	24m
T3	**Forest (North Coast DSF)**	<0° Upslope	**20m**	24m
T4	**Forest (North Coast DSF)**	<0° Upslope	**20m**	24m
T5	**Forest (North Coast DSF)**	>5° - 10° Downslope	**31m**	36m
T6	**Forest (North Coast DSF)**	>5° - <0° Downslope	**31m**	36m
T7	**Forest (North Coast DSF)**	>10° - 15° Downslope	**39m**	45m
T8	**Forest (North Coast DSF)**	>10° - 15° Downslope	**39m**	45m
T9	**Forest (North Coast DSF)**	>10° - 15° Downslope	**39m**	45m
T10	**Forest (North Coast DSF)**	>5° - 10° Downslope	**31m**	36m
T11	**Forest (North Coast DSF)**	<0° Upslope	**20m**	24m
T12	**Forest (North Coast DSF)**	<0° Upslope	**20m**	24m
T13	**Forest (Coastal Swamp Forest)**	>0° - 5° Downslope	**25m**	29m
T14	**Forest (North Coast DSF)**	>0° - 5° Downslope	**25m**	29m

Transect	Vegetation Classification (PBP 2019)	Slope Class	PBP 2019 FDI 80 Table A1.12.3	PBP 2019 FDI 100 Table A1.12.2
T15	**Forest (North Coast DSF)**	<0° Upslope	**20m**	24m
T16	**Tall Heath (Wallam Sand Heath)**	<0° Upslope	**16m**	16m
T17	**Tall Heath (Wallam Sand Heath)**	>0° - 5° Downslope	**18m**	18m
T18	**Forest (North Coast DSF)**	>5° - 10° Downslope	**31m**	39m
T19	**Forest (North Coast DSF)**	>5° - 10° Downslope	**31m**	39m
T20	**Forest (North Coast DSF)**	<0° Upslope	**20m**	24m
T21	**Shorth Heath (Coastal Heath Swamps)**	>0° - 5° Downslope	**10m**	10m
T22	**Tall Heath (Wallam Sand Heath)**	>5° - 10° Downslope	**20m**	20m
T23	**Forest (North Coast DSF)**	>0° - 5° Downslope	**25m**	29m
T24	**Rainforest**	<0° Upslope	**9m**	11m
T25	**Rainforest**	<0° Upslope	**9m**	11m
T26	**Rainforest**	<0° Upslope	**9m**	11m

All new lots and dwellings are provided with sufficient separation distance to minimise the bushfire risk to an acceptable level.

Broken Head Quarry

Figure 21

Asset Protection Zone

BUSHFIRE PLANNING AUSTRALIA

- The Subject Site
- 100m Buffer
- 140m Buffer
- Zone Boundary
- Watercourse
- Forest (North Coast Dry Sclerophyll Forest)
- Regrowth Forest (North Coast Dry Sclerophyll Forest)
- Forested Wetland (Coastal Swamp Forest)
- Rainforest
- Short Heath (Coastal Heath Swamps)
- Tall Heath (Wallum Sand Heath)
- Water

APZ

- Yellow (9m)
- Red (20m)
- Orange (25m)
- Blue (31m)
- Pink (39m)

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 08/09/19
Surface analysis: Derived from ByronBay2010_5566824_56_0002_0002_1m: © Department Finance, Services and Innovation 2010
Vegetation: JWA Ecological Consultants 2020 (modified by BPA June 2020)
Zoning: Department of Planning, Industry and Environment 2020

N W E S

0 50 100 150 200
Meters

A3 Scale: 1:4,000

File:BrokenHdQuarry_Fig18_APZ_201113 Date: 13/11/2020

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5.2. Landscaping and Vegetation Management

In APZs and IPAs, the design and management of the landscaped areas in the vicinity of buildings have the potential to improve the chances of survival of people and buildings. Reduction of fuel does not require the removal of all vegetation. Trees and plants can provide some bushfire protection from strong winds, intense heat and flying embers (by filtering embers) and changing wind patterns.

Generally landscaping in and around a bushfire hazard should consider the following:

- Priority given to retaining species that have a low flammability;
- Priority given to retaining species which do not drop much litter in the bushfire season and which do not drop litter that persists as ground fuel in the bush fire season;
- Priority given to retaining smooth barked species over stringy bark; and
- Create discontinuous or gaps in the vegetation to slow down or break the progress of fire towards the dwellings.

Landscaping within APZs and IPAs should give due regard to fire retardant plants and ensure that fuel loads do not accumulate as a result of the selected plant varieties.

The principles of landscaping for bushfire protection aim to:

- Prevent flame impingement on dwellings;
- Provide a defendable space for property protection;
- Reduce fire spread;
- Deflect and filter embers;
- Provide shelter from radiant heat; and
- Reduce wind speed.

Avoiding understorey planting and regular trimming of the lower limbs of trees also assists in reducing fire penetration into the canopy. Rainforests species such as Syzygium and figs are preferred to species with high fine fuel and/or oil content.

Trees with loose, fibrous or stringy bark should be avoided. These trees can easily ignite and encourage ground fire to spread up to, and then through the crown of trees.

Consideration should be given to vegetation fuel loads present on site with particular attention to APZs.

Careful thought must be given to the type and physical location of any proposed site landscaping. Inappropriately selected and positioned vegetation has the potential to ‘replace’ any previously removed fuel load.

Bearing in mind the desired aesthetic and environment sought by site landscaping, some basic principles have been recommended to help minimise the chance of such works contributing to the potential hazard on site.

Specific requirements for the management of vegetation and landscaping around vulnerable developments and within the APZ the following conditions apply:

- Within 10m of a building, flammable objects such as plants, mulches and fences must not be located close to vulnerable parts of the building such as windows, decks and eaves;
- Trees must not overhang the roofline of the building, touch walls or any other elements of a building;
- Grass should be no more than 100mm in height. All leaves and vegetation debris are to be removed at regular intervals (rake leaves and twigs from grass every week during the fire season);

- Establish lawn substitutes including non-flammable ground covers such as decorative stone or gravel;
- Plants greater than 100m in height at maturity must not be placed directly in front of a window or other glass features;
- Tree canopy separation of 2 metres and overall canopy cover no more than 15% at maturity;
- Preference should be given to smooth barked and evergreen trees;
- Shrubs should not be located under trees;
- Shrubs should not form more than 10% ground cover; and
- Provide a reliable and sufficient water supply and installation of sprinkler systems to create a well-watered landscape.

Whilst it is recognised that fire-retardant plant species are not always the most aesthetically pleasing choice for site landscaping, the need for adequate protection of life and property requires that a suitable balance between visual and safety concerns be considered.

It is reiterated again that it is essential that any landscaped areas and surrounds are subject to ongoing fuel management and reduction to ensure that fine fuels do not build up.

5.3. Access

In the unlikely event of a serious bushfire, it will be essential to ensure that adequate ingress / egress and the provision of defendable space are afforded in the subdivision layout. All dwellings must have direct access to a public road. Section 5.3.2 of PBP 2019 requires a development to provide safe operational access to structures and water supply for emergency services while residents are seeking to evacuate.

Refer to **Appendix A** for the development plans indicating the proposed access arrangements. A two-way through road is provided with two separate egress routes. Where possible, perimeter roads are provided where the lots do not adjoin existing or future residential development. A small number of lots are separated from the bushfire hazard by a fire trail that connects to the network of fire trails or public roads (temporary fire trails until future stages completed). The hazard in these locations is upslope from the lot.

All new roads are safe, all-weather and provide good access to all parts of the site; and a compliant water supply will be available for emergency services.

Overall, it is considered the existing and proposed road network provides safe operational access for emergency service personnel and is also appropriate for evacuation purposes.

5.4. Services – water electricity and gas

5.4.1. Water

Fire hydrant spacing, sizing and pressure should comply with AS 2419.1 – 2005. Hydrants are not to be located within any road carriageway.

All sites within the proposed development will be connected to the internal reticulated water supply.

5.4.2. Electricity

All electricity services will be located underground.

5.4.3. Gas

Any reticulated or bottled gas should be installed and maintained according to the requirements of the relevant authorities and AS 1592-2002. It is expected that the location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.

5.5. Construction Standards: Bushfire Attack Level

All buildings must satisfy the Performance Requirements of the National Construction Code: Building Code of Australia (BCA). Part 2.3 of Volume 2 of the BCA applies to dwellings located within designated bushfire areas, which are defined as:

> *Land which has been designated under a power in legislation as being subject, or likely to be subject to, bushfires.*

Accordingly, all forthcoming habitable buildings must satisfy the requirements of Part 3.7.4 of the BCA. The *Deemed-to-Satisfy* (DTS) provision of the BCA can only be achieved if dwellings in bushfire prone areas are constructed in accordance with Australian Standard *AS3959-2018 Construction of buildings in bushfire prone areas*. Alternatively, the DTS provisions can also be achieved if the habitable building is constructed in accordance with the NASH Standard 'Steel Framed Construction in Bushfire Areas'.

Building design and the materials used for construction of future dwellings should be chosen based on the information contained within AS3959-2018, and accordingly the designer/architect should be made aware of this recommendation.

The determinations of the appropriate bushfire attack level (BAL) is based on the maximum potential radiant heat exposure. BALs are based upon parameters such as weather modelling, fire-line intensity, flame length calculations, as well as vegetation and fuel load analysis. The determination of the BAL is derived by assessing the:

- Relevant FDI = 80;
- Flame temperature = 1090K;
- Slope = variable;
- Vegetation classification = *forest*; and
- Building location.

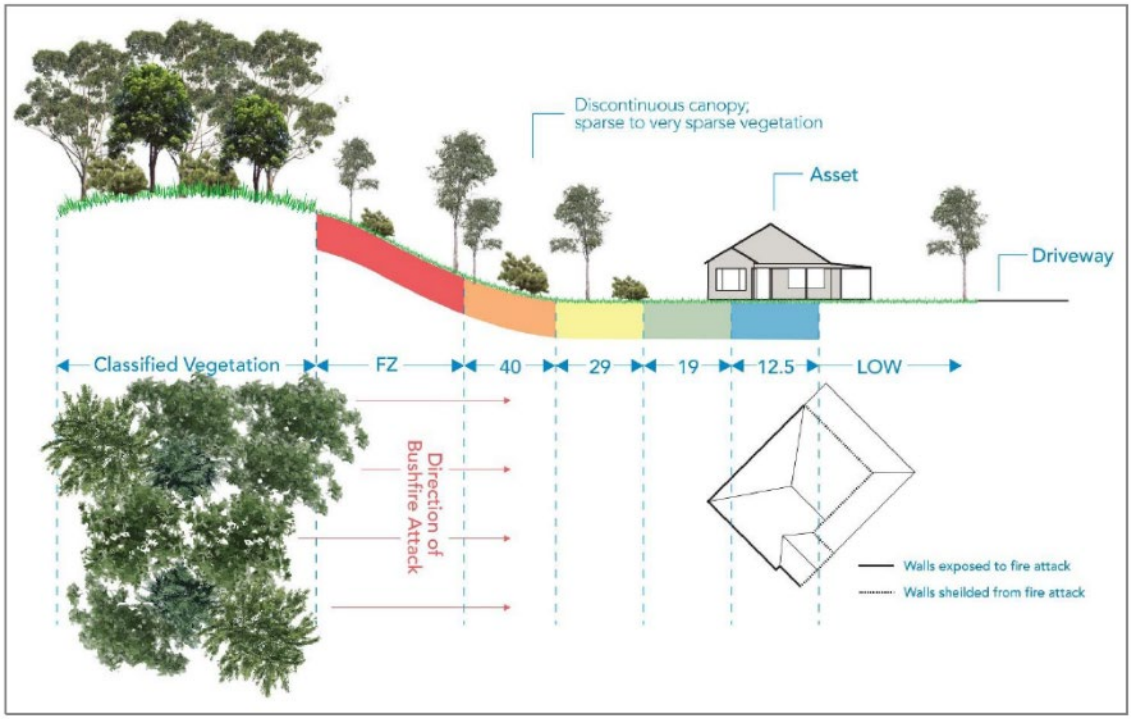

Figure 22: Bushfire Attack Level

Broken Head Quarry

Figure 23

BAL Contour Plan

BUSHFIRE PLANNING AUSTRALIA

- The Subject Site
- 100m Buffer
- 140m Buffer
- Contour (10m)
- Contour (2m)
- Watercourse
- Asset Protection Zone

Required Bushfire Attack Levels (AS3959-2018)

- BAL - FZ
- BAL - 40
- BAL - 29
- BAL - 19
- BAL - 12.5

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 08/09/19
Surface analysis: Derived from ByronBay2010_5566824_56_0002_0002_1m: © Department Finance, Services and Innovation 2010
Vegetation: JWA Ecological Consultants 2020 (modified by BPA June 2020)
Zoning: Department of Planning, Industry and Environment 2020

N W E S

0 50 100 150
Meters

A3 Scale: 1:3,000

File:BrokenHdQuarry_Fig20_BALs_201113 Date: 13/11/2020

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6. Conclusion and Recommendations

Bushfire Planning Australia (BPA) has been engaged by the Winten Property Group (the 'Client') to undertake a Strategic Bushfire Study (SBS) and Bushfire Assessment Report (BAR) for the proposed rural residential use of the former Broken Head Quarry site.

This SBS finds the site exposed to a high bushfire hazard to the south and a moderate bushfire hazard to the west. The predominant vegetation surrounding the site is consistent with a *forest* vegetation formation, which is fragmented by areas of *rainforest* and *tall heath* vegetation formation. The SBS concludes that the hazard identified can be successfully mitigated by applying the requirements of PBP 2019, along with some additional measures which build in a climate change resilience factor.

In summary, the following key recommendations have been designed to enable any future residential proposed development to achieve the aims and objectives of PBP 2019:

1. The entire site shall be managed as an Inner Protection Area (IPA) as outlined within Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;
2. Asset Protection Zones shall be established as shown in **Figure 21** and maintained as outlined Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones. Where an APZ is indicated on public land (road reserve), the vegetation is not required to be managed as an APZ;
3. All land within future stages of the site within 100m of the site shall be managed as a Temporary APZ as outlined Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;
4. Access shall be provided in accordance with Table 5.3b of PBP 2019. This will require the provision of two (2) separate road access points to Broken Head Road from each development site to ensure safe evacuation for all residents;
5. Vegetation within road verges and stormwater basins to be consistent with a grassland vegetation classification with tree canopy less than 10% at maturity (and considered unmanaged);
6. All future dwellings to be constructed on the proposed lots shall have due regard to the specific considerations given in the National Construction Code: Building Code of Australia (BCA) which makes specific reference to Australian Standard AS3959-2018 Construction of buildings in bushfire prone areas (AS3959-2018) and the NASH Standard Steel Framed Construction in Bushfire Prone Areas;
7. All new lots are to be connected to a reliable water supply network and that suitable fire hydrants are located throughout the development site that are clearly marked and provided for the purposes of bushfire protection. Fire hydrant spacing, sizing and pressure shall comply with AS2419.1 2005 and section 5.3.3 of PBP 2019;
8. An additional static water supply of 5,000L per residential lot is to be provided with appropriate equipment and connections complying with section 5.3.3 of PBP 2019;
9. Consideration should be given to landscaping and fuel loads on site to decrease potential fire hazards on site;
10. All future landowners should prepare a Bushfire Survival Plan in accordance with the RFS guide to preparing a Bushfire Survival Plan; and
11. A Fire Management Strategy or Fire for Conservation Management Plan shall be prepared for the residue lot in accordance with the RFS Bush Fire Environmental Assessment Code and the RFS Rules and Notes for implementation of the Threatened Species Hazard Reduction List for the Bush Fire Environmental Assessment Code.

12. A vegetation plan of management shall be prepared for future subdivision application(s) to ensure that any vegetation regrowth on site will be kept to manageable levels and there will be no fire corridor created which could spread fire towards assets.
13. A community education plan shall be prepared to provide education programs to the future community regarding bush fire risk and emergency response.

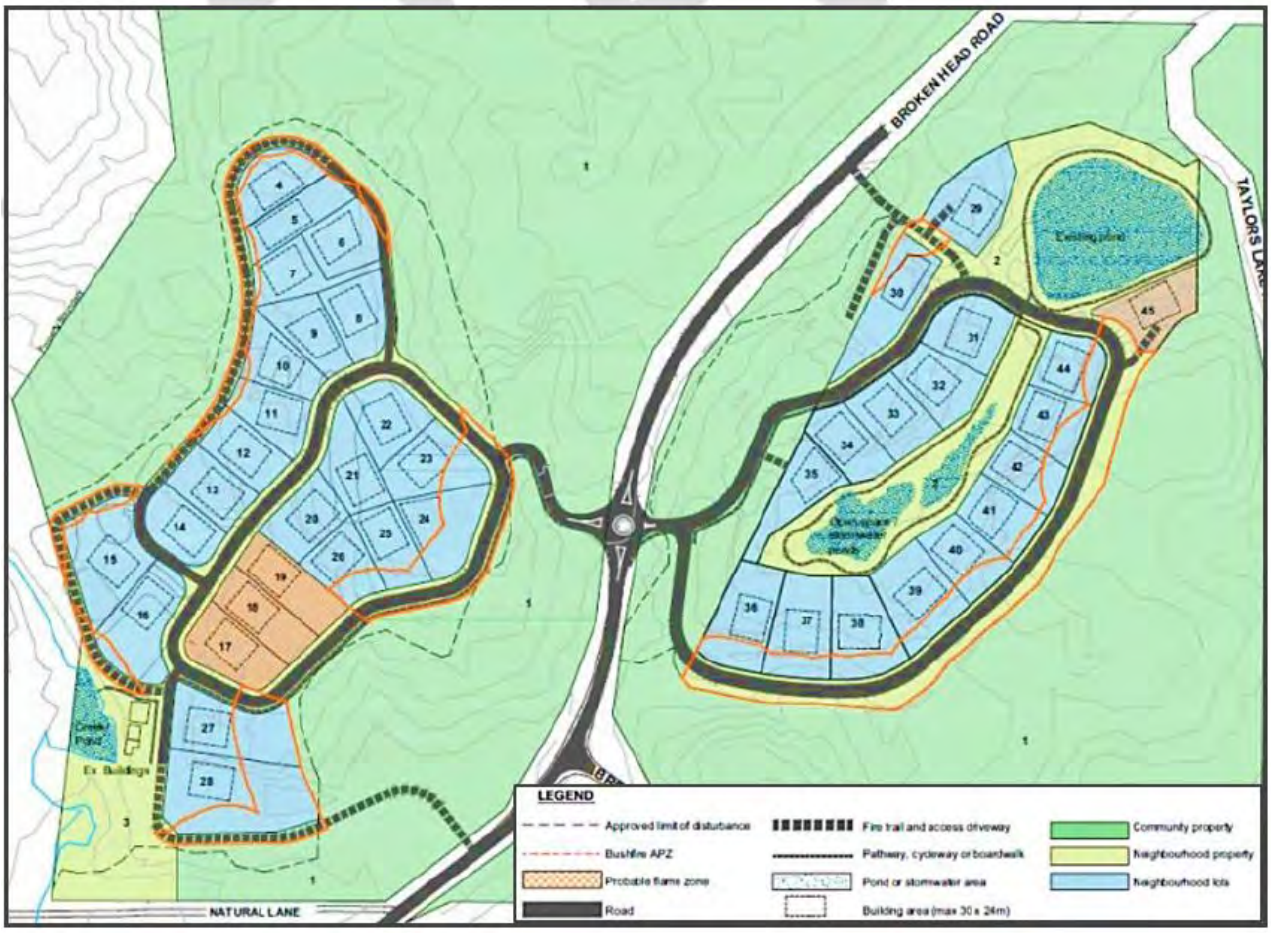
This assessment has been made based on the bushfire hazards observed in and around the site at the time of inspection and production (October 2020).

Should the above recommendations be implemented, the existing bushfire risk should be suitably mitigated to offer an acceptable level of protection to life and property for those persons and assets occupying the site but they do not and cannot guarantee that the area will not be affected by bushfire at some time and that property and life damage/loss will not occur.

7. References

- Douglas, G 2017. Property Protection from Extreme Bushfire Events under the Influence of Climate Change. Submitted for the degree of Doctor of Philosophy at Western Sydney University.
- Dunlop, M., & Brown, P.R. 2008. Implications of climate change for Australia's National Reserve System: A preliminary assessment. Report to the Department of Climate Change, February 2008. Department of Climate Change, Canberra, Australia.
- NSW Rural Fire Service (2005). *Standards for Asset Protection Zones*. NSW Rural Fire Service.
- NSW Rural Fire Service (2019). Planning for Bushfire Protection – A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners.
- Ramsay, GC and Dawkins, D (1993). *Building in Bushfire-prone Areas – Information and Advice*. CSIRO and Standards Australia.
- Rural Fires and Environmental Assessment Legislation Amendment Act 2002.
- Standards Australia (2018). AS 3959 – 2018: Construction of Buildings in Bushfire-prone Areas.

Appendix A: Plan of Community Title Subdivision



Appendix B: AHIMS Search Results

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 2025 Broken Head

Client Service ID : 534413

Stuart Greville

21 Costata Crescent
Adamstown New South Wales 2289

Attention: Stuart Greville

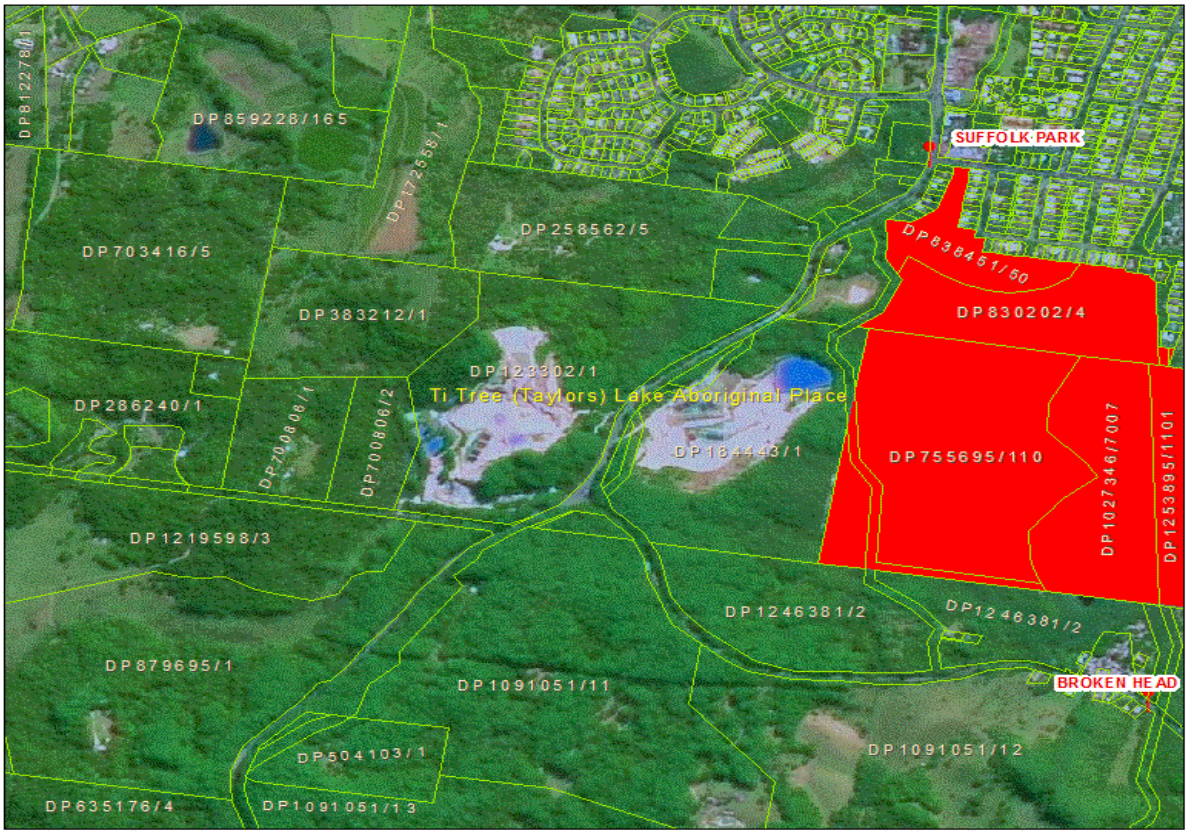
Email: sgreville@bigpond.com

Date: 10 September 2020

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -28.7031, 153.5891 - Lat, Long To : -28.6884, 153.6125 with a Buffer of 50 meters, conducted by Stuart Greville on 10 September 2020.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

5	**Aboriginal sites are recorded in or near the above location.**
1	**Aboriginal places have been declared in or near the above location. ***

ID	Aboriginal Place Name
105	Ti Tree (Taylors) Lake

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
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Tel: (02) 9585 6380 Fax: (02) 9873 8599

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Web: www.environment.nsw.gov.au