

STRATEGIC BUSHFIRE STUDY

RESIDENTIAL SUBDIVISION

225 Terranora Road, Banora Point

Prepared for Alan Hope



Bushfire Planning Australia

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BPA Reference: 2133 Banora Point

Prepared for Alan Hope c/o Planit Consulting

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Date: 12 April 2023



Disclaimer and Limitation

This report is prepared solely for Alan Hope (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: 2133 - Strategic Bushfire Study

Version	Status	Purpose	Author	Review Date
1	Draft	Draft for Review	Katrina Mukevski	22 March 2023
2	Draft	Draft for Client Review	Stuart Greville	5 April 2023
3	Final	Final for Submission	Stuart Greville	5 April 2023
4	Final	Final with Client Comments	Stuart Greville	12 April 2023

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 45 of the Rural Fires Regulation 2021 and Appendix 2 of Planning for Bushfire Protection 2019 in accordance with the requirements of section 4.14 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Stuart Greville

Accredited Bushfire Practitioner

BPAD-26202

Date: 12 April 2023



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 Alan Hope (the 'Client') to undertake a Strategic Bushfire Study (SBS) and Bushfire Assessment Report (BAR) for the proposed residential subdivision of 225 Terranora Road, Banora Point.

This SBS finds the site exposed to a medium bushfire hazard to the south and a moderate bushfire hazard to the west. The predominant vegetation surrounding the site is consistent with a *rainforest* vegetation formation 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.

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 to be zoned R5 Large Lot Residential 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 14** and maintained as outlined Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones.
3. Access shall be provided in accordance with concept plan;
4. 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;
5. A static water supply of 10,000L per residential lot is to be provided with appropriate equipment and connections complying with section 5.3.3 of PBP 2019; and
6. Consideration should be given to landscaping and fuel loads on site to decrease potential fire hazards on site.

This assessment has been made based on the bushfire hazards observed in and around the site at the time of inspection and production (April 2023).

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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Appendix A: Plan of Community Title Subdivision
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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
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)
TSC	Tweed Shire Council

1. Introduction

Bushfire Planning Australia (BPA) has been appointed by Alan Hope (the 'Client') to undertake a Strategic Bushfire Study (SBS) and Bushfire Assessment Report (BAR) for the proposed residential subdivision of 225 Terranora Road, Banora Point ("the site"); legally known as Lot 16 DP856265.

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 2022*.

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.

The assessment aims to consider and assess the bushfire hazard and associated potential bushfire threat relevant to the proposed development, and to outline the minimum mitigative measures which would be required in accordance with the provisions of PBP 2019 and the *Rural Fires Regulation 2022*.

This assessment has been undertaken in accordance with clause 45 of the Rural Fires Regulation 2022. This BAR also addresses the aims and objectives of PBP 2019, being:

- ☐ Afford buildings and their occupants protection from exposure to a bushfire;
- ☐ Provide for a defensible space to be located around buildings;
- ☐ Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent 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 bushfire protection measures (BPMs); and
- ☐ Ensure that utility services are adequate to meet the needs of firefighters.

1.2. Strategic Bushfire Planning

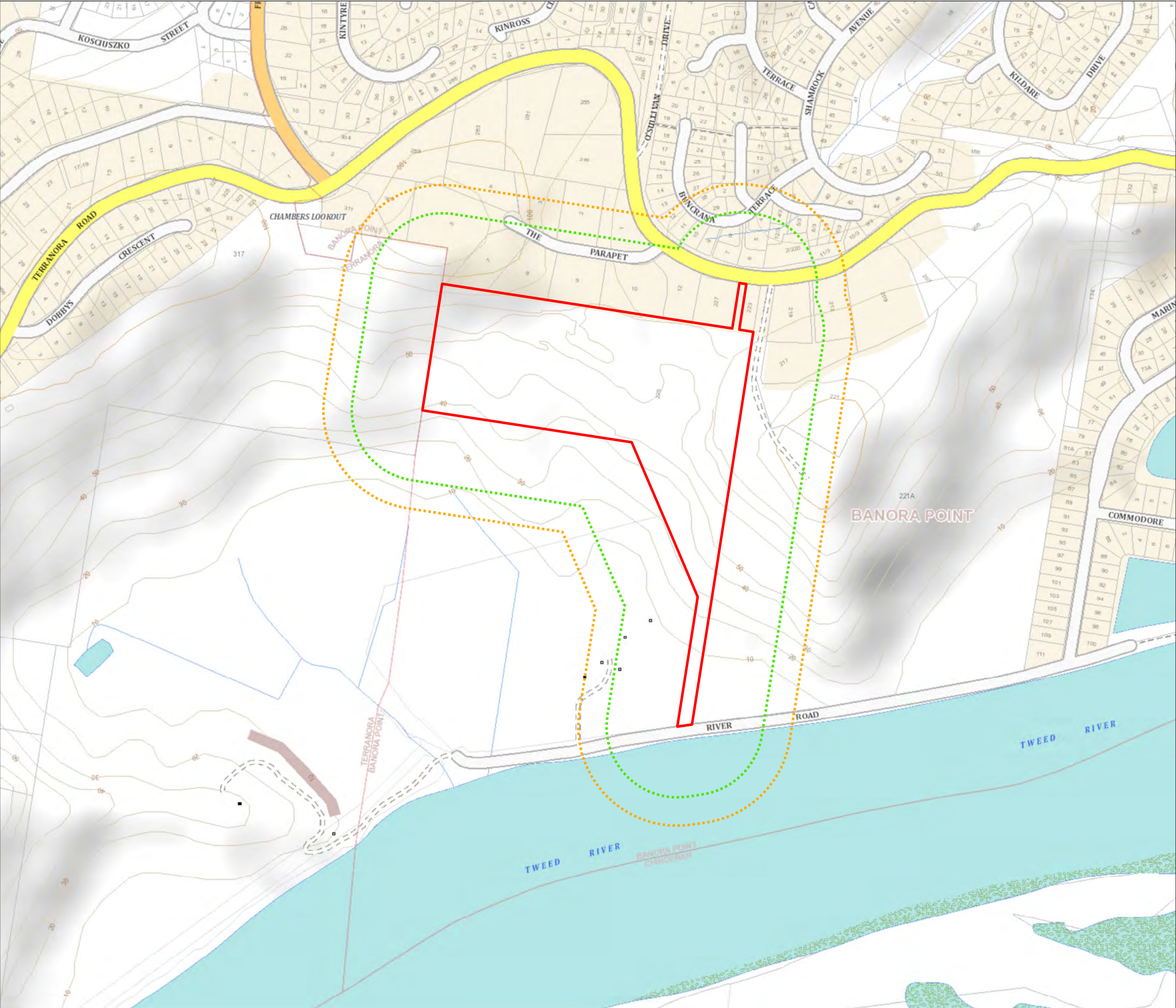
This report supports an application for a planning proposal (rezoning) and therefore provides a Strategic Bush Fire Study (SBS) in accordance with Chapter 4 of Planning for Bush Fire Protection 2019. The SBS responds to high level guidance regarding the need to assess the appropriateness of future development 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 dwellings on each of the new lots.

2. Site Description

Table 1: Site Description

Address	225 Terranora Road, Banora Point
Title	Lot 16 DP856265
LGA	Tweed Shire Council
Subject Site/ Study Area	10.17 ha
Development Site	~4 ha
Land Use Zone	RU2 Rural Landscape, R5 Large Lot Residential and DM Deferred Matter (Figure 2)
Bushfire Prone Land	YES: Vegetation Category 1, Vegetation Category 2 and Vegetation Buffer (Figure 3)
Context	Former quarry, partially cleared with a narrow handle south to River Road
Topography	Level development footprint falling steeply south down to the river floodplain
Fire Danger Index	FDI 80
Fire History	No fire history directly impacting site



225 Terranora Road,
Banora Point 2486

Figure 1
**Site
Location**

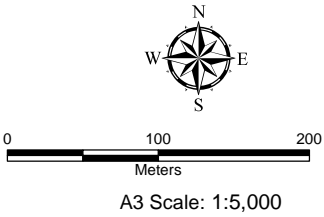


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- Subject Site
- 140m Buffer
- 100m Buffer

SOURCE:
Cadastral Boundary: NSW Department of Finance,
Services and Innovation 2021



File:BanoraPoint-Fig1-Locality-210720 Date: 20/07/2021

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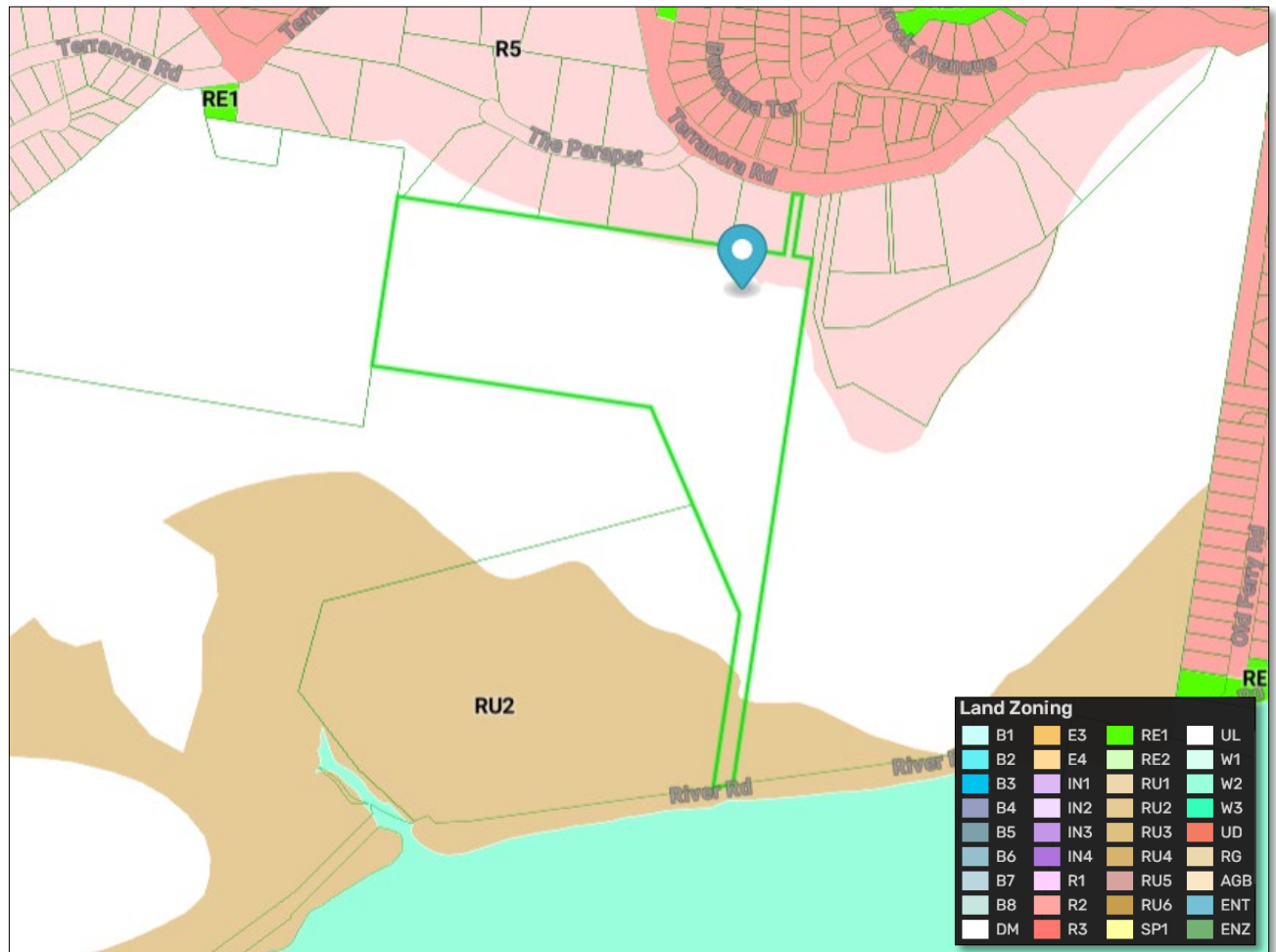


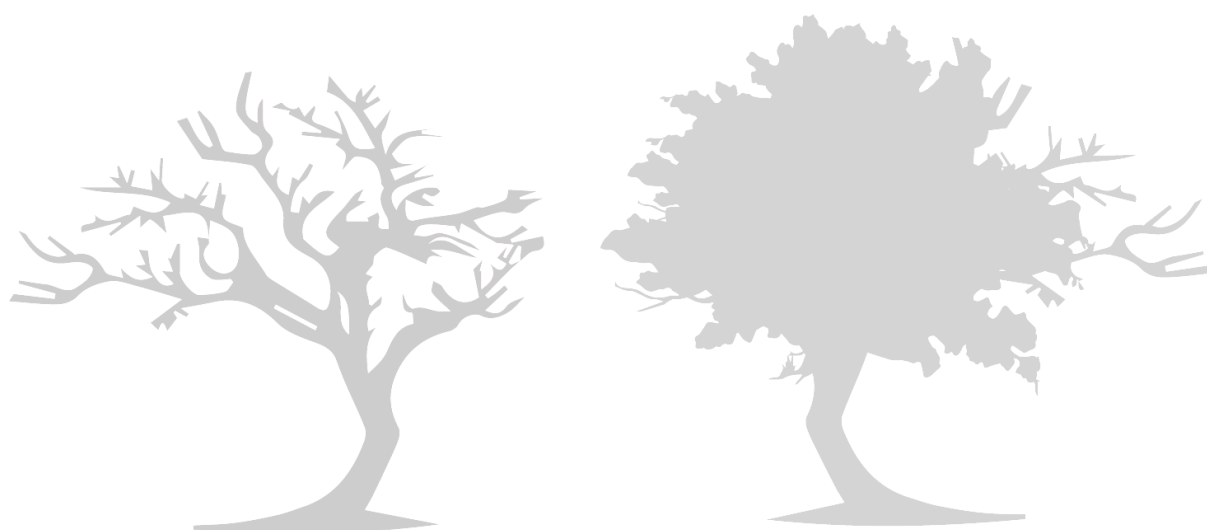
Figure 2: Existing Land Use Zone map (Tweed Local Environmental Plan 2014)

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 3 demonstrates that western and southern portions of the site is mapped as Vegetation Category 1 bushfire prone land. This extends within and beyond 140m of the proposed site and is identified as the primary bushfire hazard.

There is also a small narrow corridor of Vegetation Category 2 bushfire prone land located towards the middle of the site. This is surrounded by Vegetation Buffer which extends to the north and north-east within and external to the site into neighbouring residential properties.





225 Terranora Road,
Banora Point 2486

Figure 3

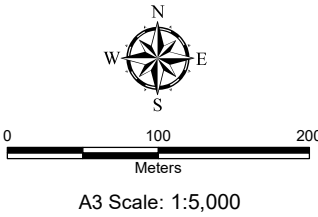
NSW Bush Fire Prone Land



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- Subject Site
- 140m Buffer
- 100m Buffer
- Bushfire Prone Land**
 - Vegetation Category 1
 - Vegetation Category 2
 - Buffer

SOURCE:
Cadastral Boundary: NSW Department of Finance,
Services and Innovation 2021
Aerial photo: NearMap 06/06/21
NSW Bush Fire Prone Land: NSW Rural Fire Service



File:BanoraPoint-Fig2-BFPL-210720 Date: 20/07/2021

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2.2. Proposed Development

This report is prepared in support of a Planning Proposal to rezone the rehabilitated areas of the quarry from Deferred Matter to R5 Large Lot Residential.

The intended outcome of the Planning Proposal is to convert cleared and disturbed land into three large lots purposed for residential development. The existing minimum lot size under the current zoning is 40ha, under the proposed new zoning the minimum lot size would be 10,000m² for proposed Lot 1 and Lot 2 and 21,816m² for proposed Lot 3, all with a building height of no more than 9m, or three storeys.

The conceptual subdivision plan is contained in **Appendix A** and shown in **Figure 4**.

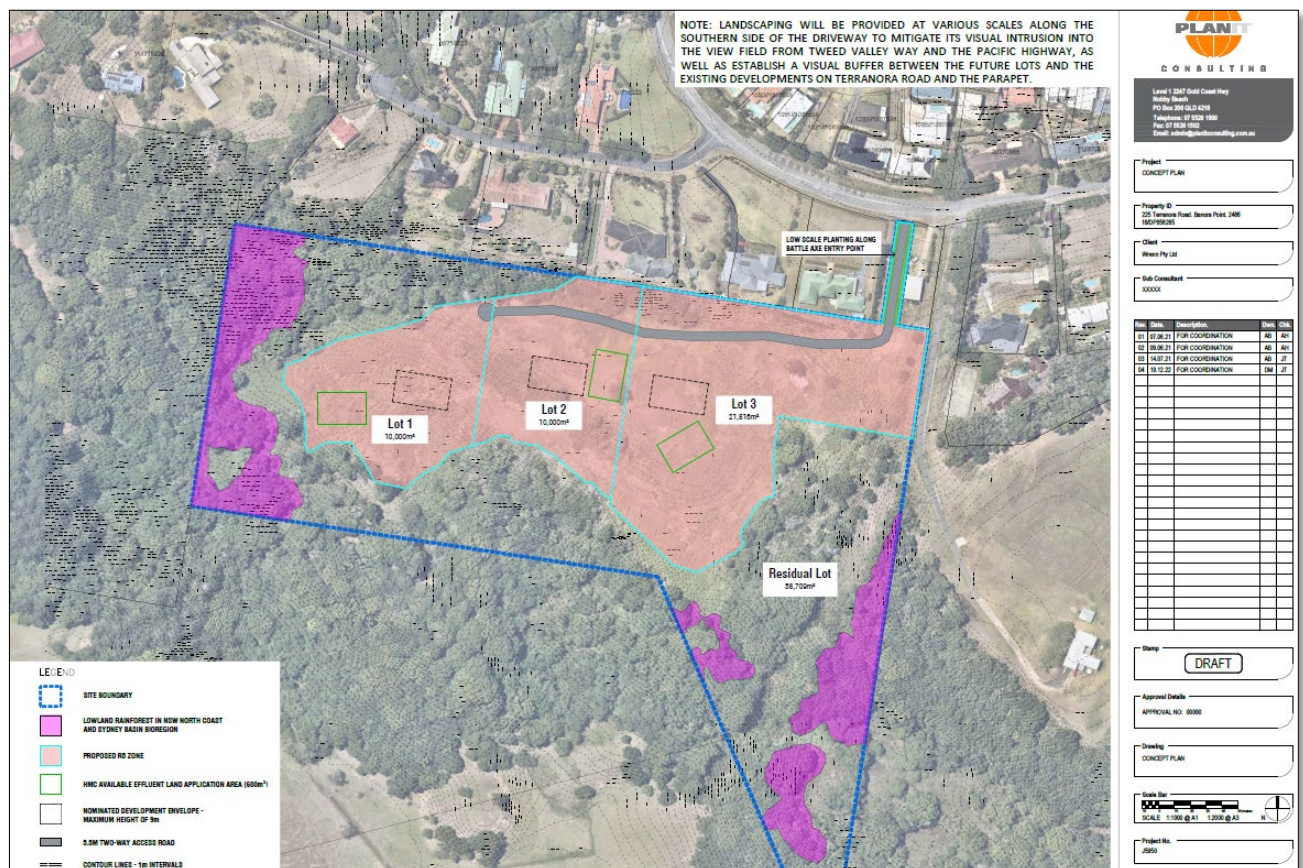


Figure 4: Plan of proposed residential subdivision

3. Bushfire Hazard Assessment

The Bushfire Hazard Assessment is conducted on a more localised scale, assessing vegetation categories out to a distance of 140 metres and slope to a distance of 100m, in accordance with the Site Assessment Methodology within Appendix 2 of PBP 2019. This establishes a more localised risk context for the development and specific bush fire protection measures required for the subdivision of the land to occur.

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);
- ❑ Reference to NSW State Vegetation Type Mapping NSW Department of Planning and Environment 2022 (**Figure 5**); and
- ❑ Site inspection by Stuart Greville on 9 July 2021.

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.



Plate 1: Looking west along northern boundary at rear of existing properties



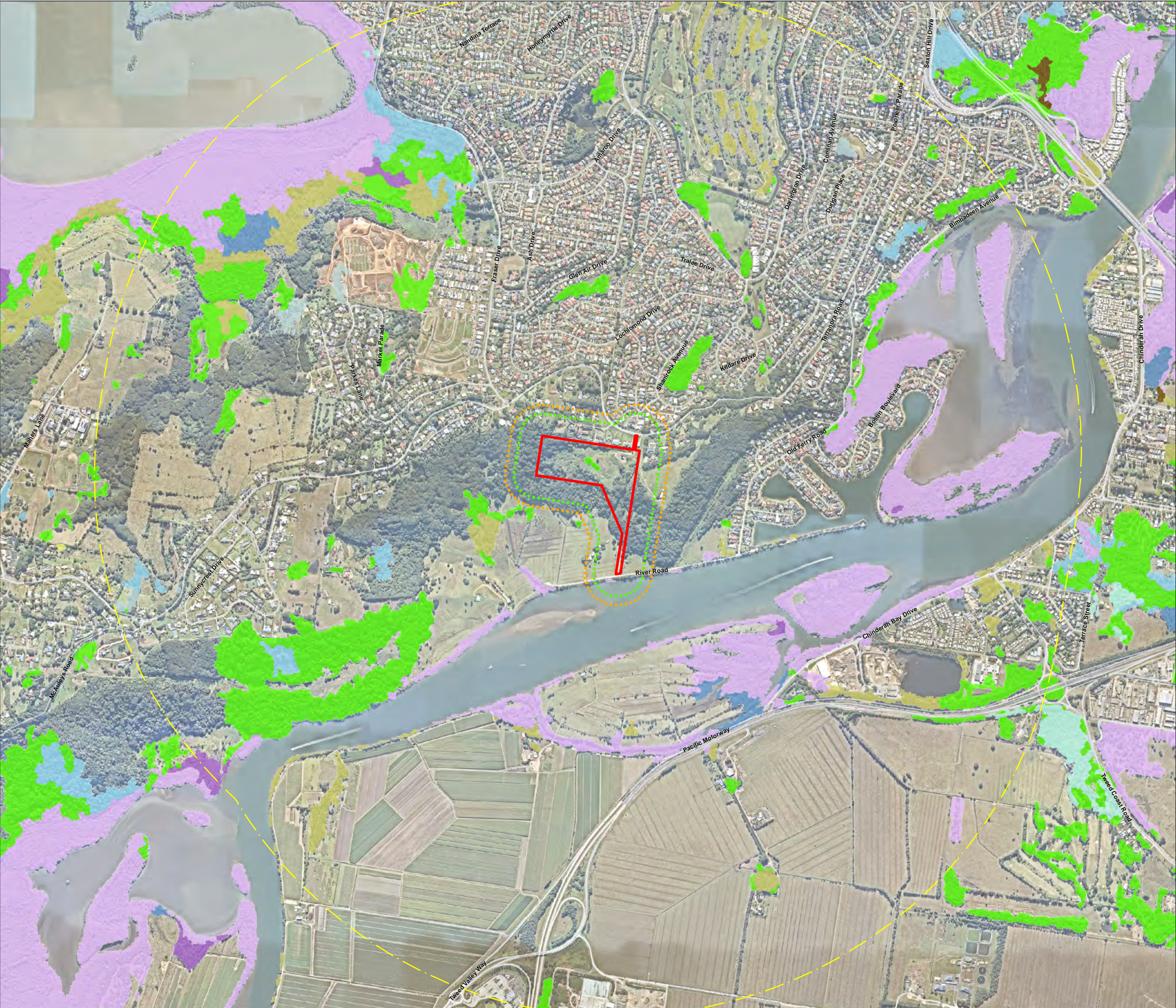
Plate 2: Existing vegetation within development footprint is dominated with exotics and non-endemic species



Plate 3: Second road frontage on River Road looking north



Plate 4: Vegetation across Terranora escarpment classified as a *rainforest*



225 Terranora Road,
Banora Point 2486

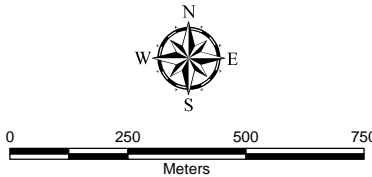
Figure 5
**NSW State
Vegetation
Type (2km)**



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- | | | |
|----------------------------|-----------------------------|---|
| Subject Site | 2km Buffer | Coastal Swamp Forests |
| 140m Buffer | 100m Buffer | Coastal Dune Dry Sclerophyll Forests |
| Vegetation Class | | Northern Hinterland Wet Sclerophyll Forests |
| Coastal Headland Heaths | Coastal Floodplain Wetlands | North Coast Wet Sclerophyll Forests |
| Coastal Freshwater Lagoons | Mangrove Swamps | Rainforest |
| Saltmarshes | Not native vegetation | |

SOURCE:
Cadastral Boundary: NSW Department of Finance,
Services and Innovation 2021
Aerial photo: NearMap 06/06/21
NSW Vegetation Type: NSW Department of Planning,
Industry and Environment 2022



A3 Scale: 1:16,000

File:BanoraPoint-Fig3b-Vegetation-NSW-SVT-2Km-230403 Date: 3/04/2023

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3.2. Slope Assessment

The slope assessment was undertaken as follows:

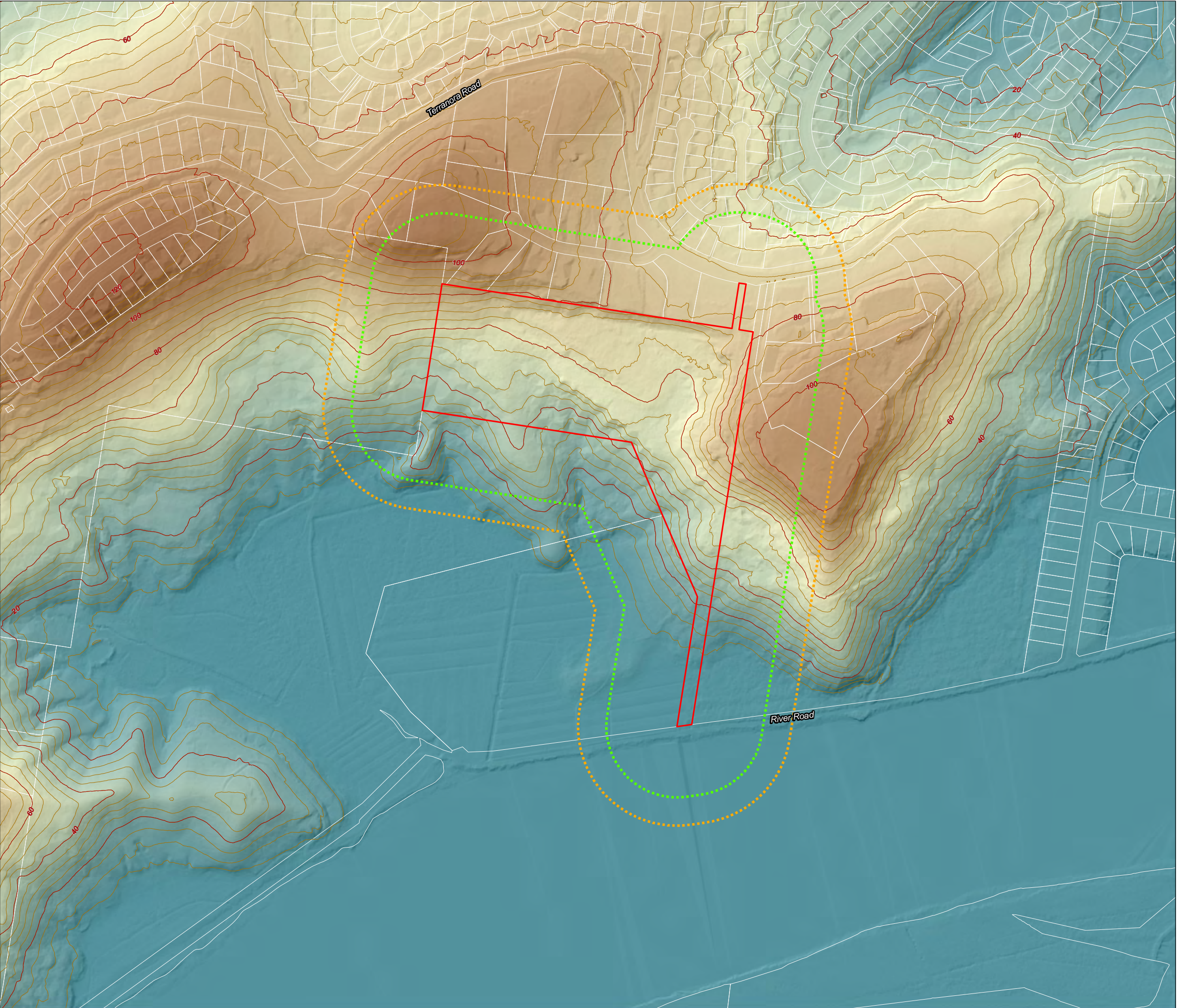
- Review of LiDAR point cloud data – including DEM (NSW LPI).

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 6** and **Figure 7**;
- Slope analysis in gradients of 5 degrees - **Figure 8** and **Figure 9**.







225 Terranora Road,
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Figure 6

Digital Elevation Model



 Subject Site


 140m Buffer


 100m Buffer

 Contour (20m)

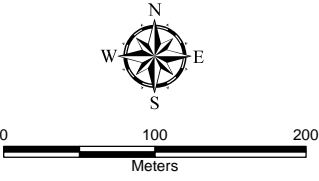
 Contour (5m)

Elevation (AHD)

 High : 122m

 Low : 0m

SOURCE:
Cadastral Boundary: NSW Department of Finance,
Services and Innovation 2021
Surface Analysis based on Tweed Heads LiDAR 1
metre Resolution Digital Elevation Model ©
Department Finance, Services and Innovation 2014

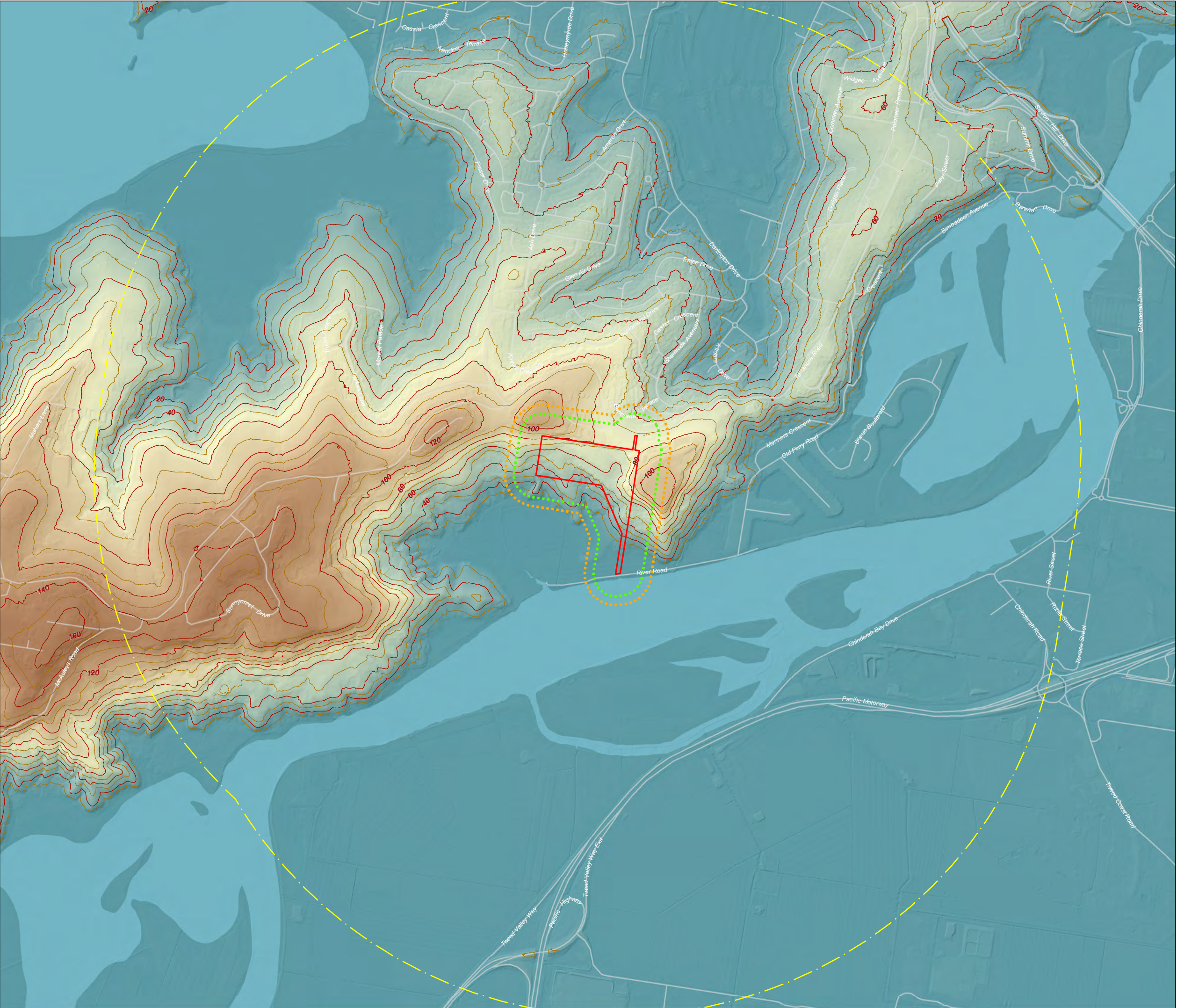


A3 Scale: 1:5,000

File:BanoraPoint-Fig5-DEM-210720 Date: 20/07/2021

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Figure 7


Digital Elevation Model (2km)





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 Subject Site

 2km Buffer


 140m Buffer

 100m Buffer

 Contour (20m)

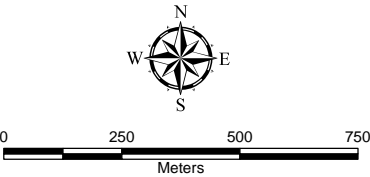
 Contour (5m)

Elevation (AHD)

 High : 168m

 Low : 0m

SOURCE:
Cadastral Boundary: NSW Department of Finance,
Services and Innovation 2021
Surface Analysis based on Tweed Heads LiDAR 1
metre Resolution Digital Elevation Model ©
Department Finance, Services and Innovation 2014



A3 Scale: 1:16,000

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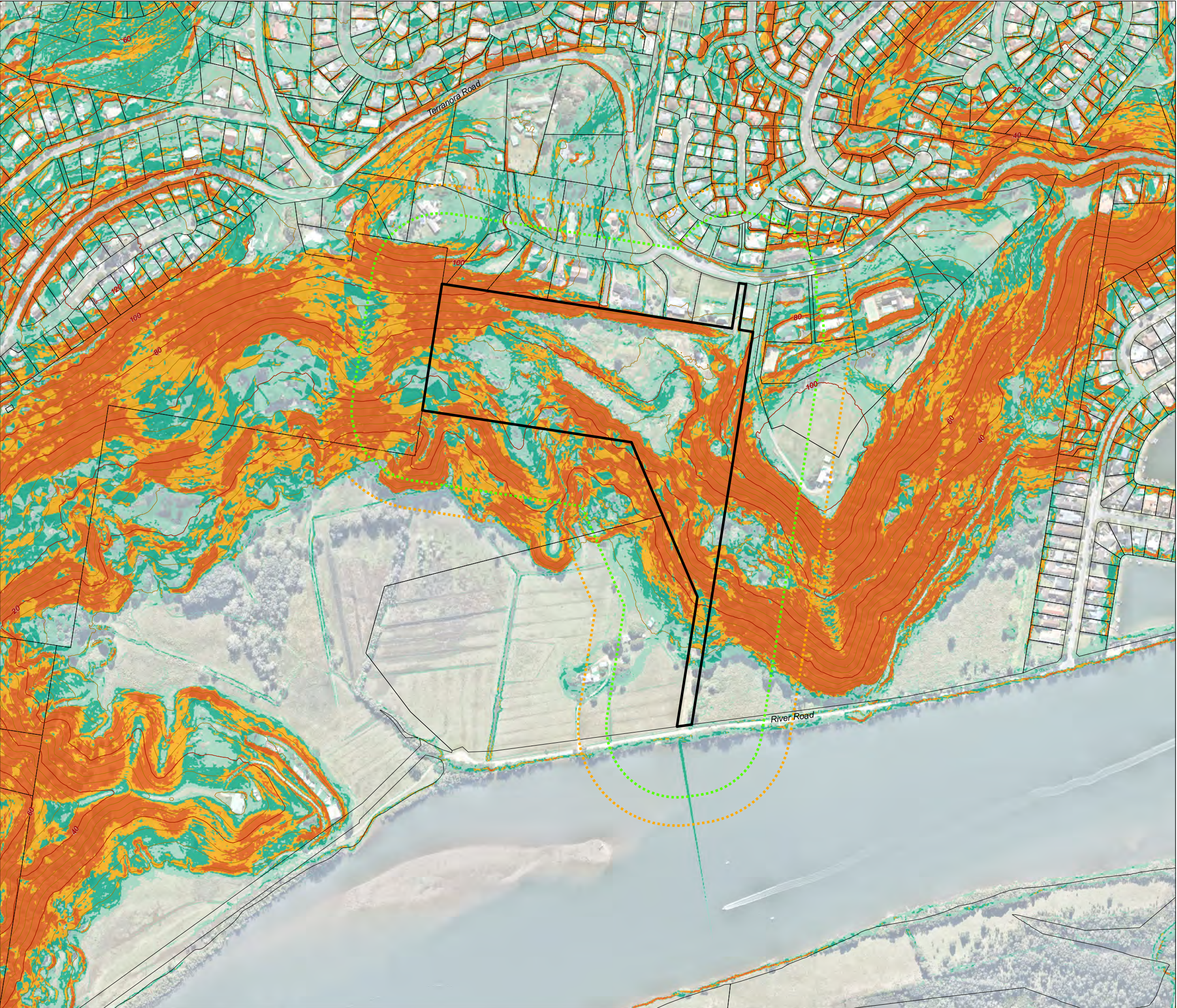
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Figure 8

Slope Analysis: LiDAR

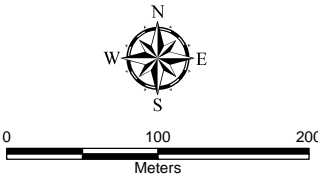


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- Subject Site
- 140m Buffer
- 100m Buffer
- Contour (20m)
- Contour (5m)

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

SOURCE:
Cadastral Boundary: NSW Department of Finance,
Services and Innovation 2021
Aerial Photo: Nearthmap 06/06/21
Surface Analysis based on Tweed Heads LiDAR 1
metre Resolution Digital Elevation Model ©
Department Finance, Services and Innovation 2014



A3 Scale: 1:5,000

File:BanoraPoint-Fig7-SlopeLiDAR-210720 Date: 20/07/2021

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Figure 9

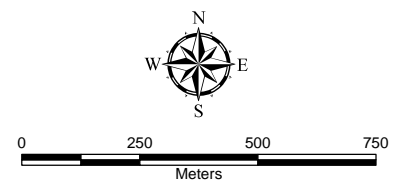
Slope Analysis: LiDAR (2km)



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- Subject Site
 - 2km Buffer
 - 140m Buffer
 - 100m Buffer
 - Contour (20m)
 - Contour (5m)
- Slope**
- 0° - 5°
 - 5° - 10°
 - 10° - 15°
 - 15° - 20°
 - >20°

SOURCE:
Cadastral Boundary: NSW Department of Finance,
Services and Innovation 2021
Aerial Photo: NearMap 06/06/21
Surface Analysis based on Tweed Heads LiDAR 1
metre Resolution Digital Elevation Model ©
Department Finance, Services and Innovation 2014



A3 Scale: 1:16,000

File:BanoraPoint-Fig8-SlopeLiDAR-2km-210720 Date: 20/07/2021

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3.3. Results

Vegetation communities have been plotted for a distance of 2km based on NSW State Vegetation Type 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.

Within and immediately adjoining the site is an area of open to closed forest infested by Camphor Laurel. There is a wide band of closed forest across the site along the southern face of the escarpment that extends to the east and west of site up to approximately 1km in either direction. Based on the dense canopy, this closed forest can be categorised as a rainforest. Notwithstanding, the extensive dominance of Camphor Laurel provides a canopy cover of greater than 70%. Regardless of the remnant vegetation type, a vegetation community so densely infested with Camphor Laurel is reclassified as a rainforest per A1.9 of PBP 2019.

Beyond the vegetation dominated by Camphor Laurel, further to the west along the northern bank of the Tweed River can be found a sub-tropical temperate rainforest; confirming the remnant vegetation that would likely occur on and surrounding the site would still be classified as a rainforest.

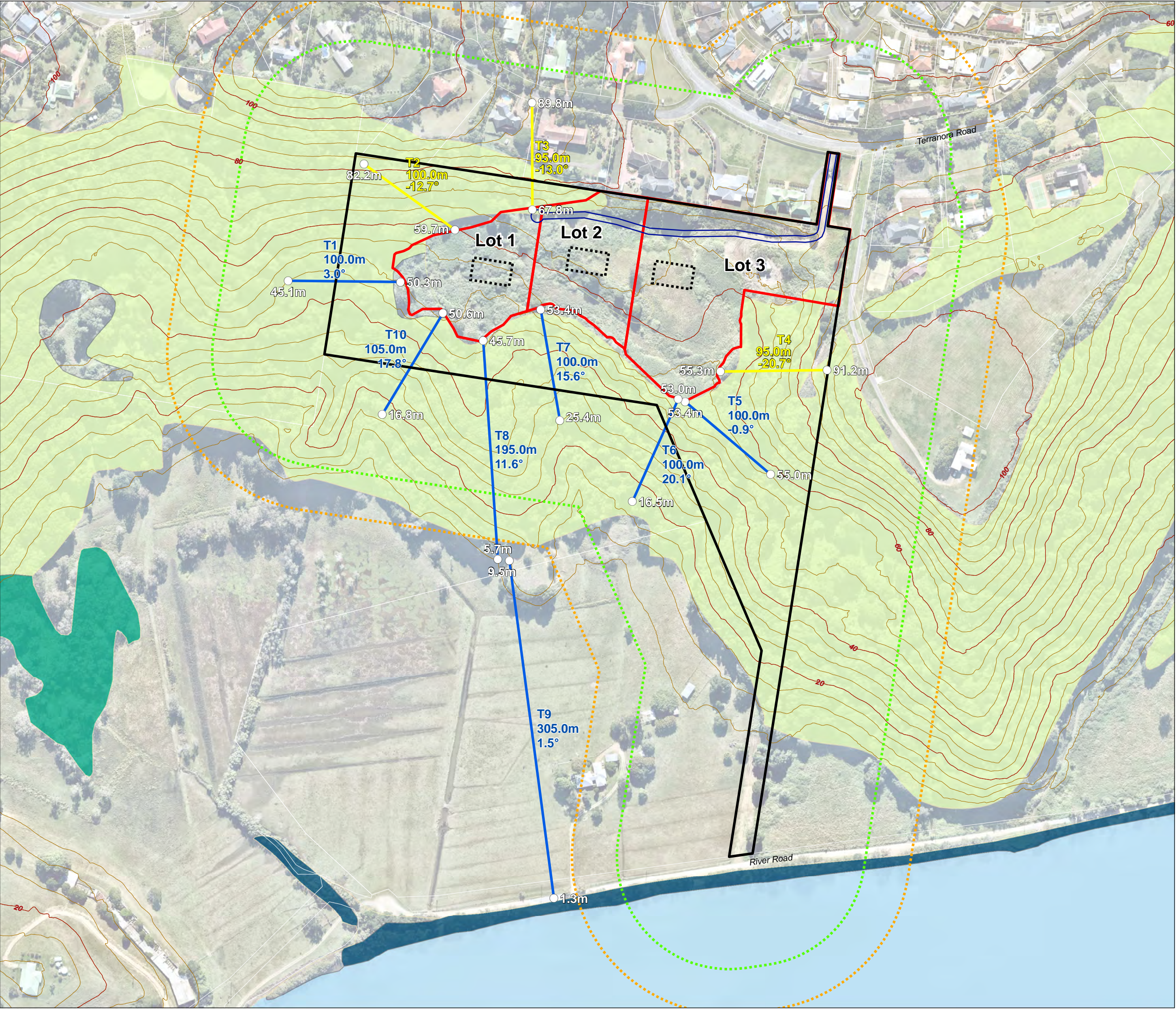
The Subtropical Rainforest, which has a multi-layered tree canopy up to 20-40m in height. The fuel load of a rainforest is typically the lowest of the forest communities due to its moisture content. Beyond the rainforest communities, along the lower floodplain on the northern and southern side of the Tweed River there are large rural residential land holdings which are mostly grassed areas or used for sugar cane farming.

Vegetation on site, within the area subject to the rezoning has been cleared is has been left unmanaged for some time. Consequently, the area of the site identified for residential use is heavily infested with weeds.

The overall landscape assessment is that the highest fuel loads are situated to the south and southeast of the site in the rainforest. These fuel loads are punctuated by rural properties to the west of the site. To the east and north the site transitions to the urban communities of Banora Point.

Table 2: Slope and Vegetation Assessment Results

Transect	Vegetation Description	Vegetation Formation (PBP 2019)	Slope
T1	Modified and disturbed remnant vegetation – evidence of exotic weed infestation	Rainforest	3.0° Downslope
T2	Modified and disturbed remnant vegetation – evidence of exotic weed infestation	Rainforest	-10.0° (-12.7°) Upslope
T3	Low-threat vegetation, landscape curtilage around dwellings, exotic weeds dominated rainforest	Rainforest	-10.0° (-13.0°) Upslope
T4	Modified and disturbed remnant vegetation – evidence of exotic weed infestation	Rainforest	-10.0° (-20.7°) Upslope
T5	Modified and disturbed remnant vegetation – evidence of exotic weed infestation	Rainforest	0.9° Downslope
T6	Modified and disturbed remnant vegetation – evidence of exotic weed infestation	Rainforest	20.1° Downslope
T7	Modified and disturbed remnant vegetation – evidence of exotic weed infestation	Rainforest	15.6° Downslope
T8	Modified and disturbed remnant vegetation – evidence of exotic weed infestation	Rainforest	11.6° Downslope
T9	Actively grazed paddock	Low threat vegetation	1.5° Downslope
T10	Modified and disturbed remnant vegetation – evidence of exotic weed infestation	Rainforest	17.8° Downslope



225 Terranora Road,
Banora Point 2486

Figure 10

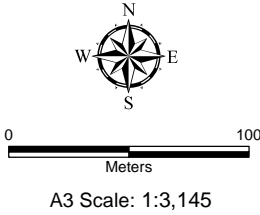
Slope and Vegetation Assessment



BUSHFIRE
PLANNING
AUSTRALIA

- | | |
|--------------------|--|
| Subject Site | Vegetation Formations |
| 140m Buffer | Forest (Forested Wetland) |
| 100m Buffer | Rainforest |
| Proposed Lots | Saline Wetlands |
| Access Driveway | Open Water |
| Building Envelope | Substantially Cleared of Native Vegetation |
| Contour (20m) | |
| Contour (5m) | |
| RL | |
| Downslope transect | |
| Upslope transect | |

SOURCE:
Cadastral Boundary: NSW Department of Finance,
Services and Innovation 2021
Aerial Photo: Nearmap 06/06/21
Surface Analysis based on Tweed Heads LiDAR 1
metre Resolution Digital Elevation Model ©
Department Finance, Services and Innovation 2014
Vegetation: Tweed LGA Vegetation VIS_ID 3912
OEH 2012



File:BanoraPoint-Fig9-SlopeVeg-230403 Date: 3/04/2023

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3.4. Significant Environmental Features

It is expected biodiversity investigations have been 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 not expected that any bushfire mitigation measures recommended in this report will require disturbance to any identified Aboriginal sites or places.



4. Strategic Bushfire Study

As this site is identified for a new residential development, the strategic principles in PBP 2019 must be addressed. This strategic bushfire study (SBS) 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 communities 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 assessment, 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 5** shows a visual representation of the landscape assessment.

4.1.1. Vegetation

Vegetation communities have been plotted for a distance of 2km based on Tweed 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.

The primary hazard the site is exposed to is the Camphor Laurel dominated Subtropical Rainforest found along the southern face of the Tweed River escarpment. The vegetated escarpment separates the urban communities to the north of the site from the Tweed River.

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 and 2km surrounding the site. The Slope Analysis LiDAR (**Figures 8 and 9**) shows various slopes surrounding the site, the steepest of which to the south of the development site. Given that the topography is a benched from the lower floodplain and levels out across the development footprint, the rate of spread of any bushfire approaching the site would vary. A fire igniting on the southern portion of the site may rapidly spread up the steep escarpment in a northerly direction towards the development footprint. However, a fire from the south but would need to engage through a closed rainforest across a fire run of less than 300m.

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.

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.

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 a medium fire danger.

4.2. Land Use Assessment

The planning proposal is to rezone the site to R5 large lot residential use including the subdivision of the site to create three (3) dwelling lots.

The BAL contour plan shows that the required asset protection zones (APZ) for residential uses under PBP 2019 can be provided by the development. For the 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.

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.

Taking all of the above into consideration, the site is considered to be appropriate for the proposed large lot 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 Terranora Road. Each new lot will be accessible via a private through road for residents to evacuate whilst emergency services are responding. All three (3) lots will have driveway which would provide additional passing and the property access road is approximately 300m in total length from Terranora Road.

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 west. The likely direction of travel in evacuation is therefore to the east of the proposed development towards the settlements of Banora Point via Terranora Road. The Banora Point shopping centre is approximately 3.5km north along Terranora Road, taking approximately 5 minutes to travel. There are facilities in this settlement which could be used for shelter.

4.4. Emergency Services

There is a NSW Fire & Rescue Station at Corporation Circuit, Tweed Heads South, approximately 4.8km or 7 minutes drive away from the site.

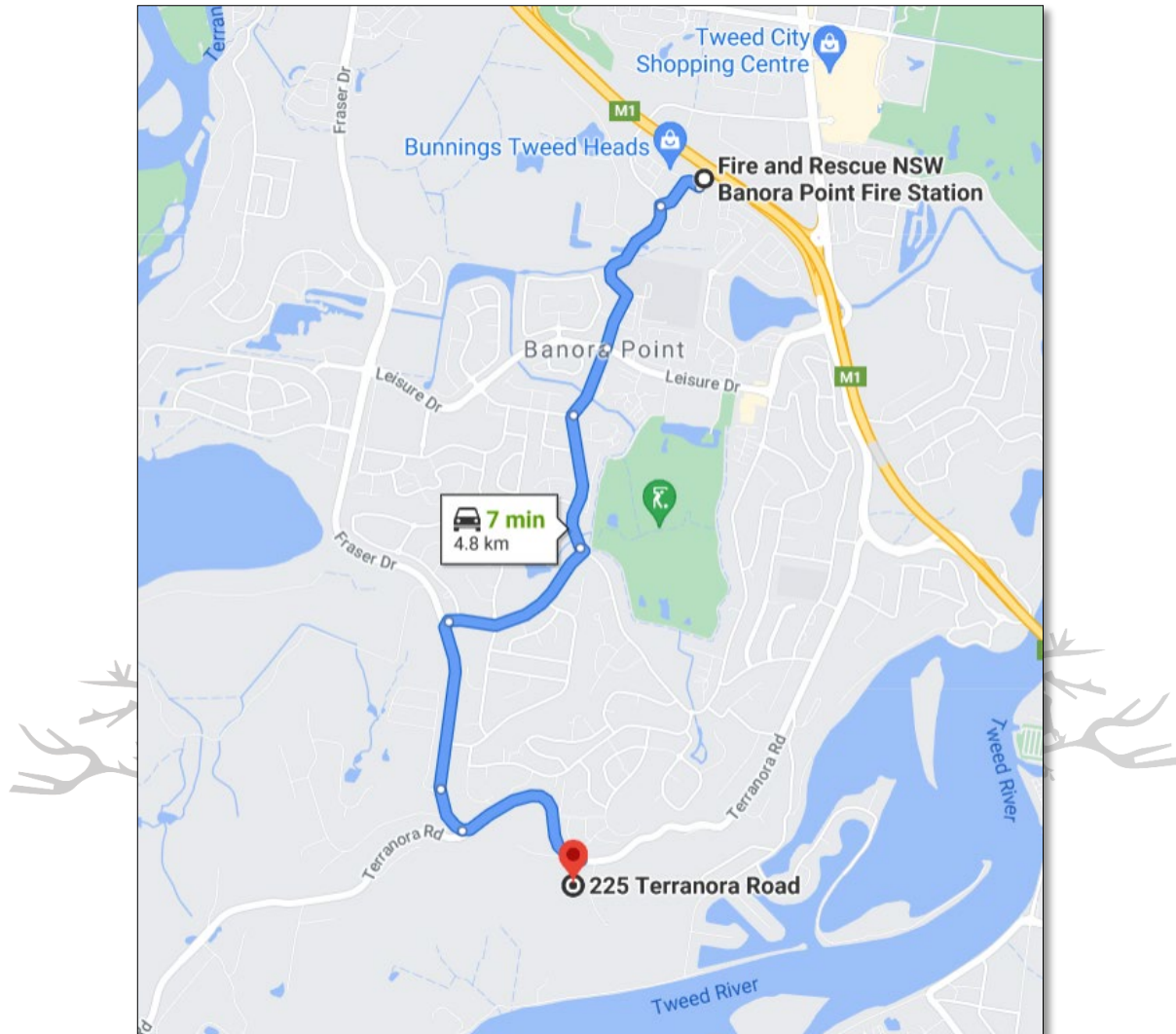


Figure 11: Fire and Rescue NSW – Banora Point Fire Station

4.5. Infrastructure

Electricity supply to the proposed lots 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.

As reticulated water cannot be guaranteed for this development, static water 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 and the future residential lots are 10,000m² or greater, it is recommended static water supply of a minimum 10,000 litres per lot. 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. Furthermore, the proposed development is likely to improve the level of protection to the existing houses adjoining the northern boundary of the site.

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 'Unlikely', commensurate with the likelihood of the existing surrounding properties located along the Terranora Escarpment. 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.

Following the landscape assessment given above, the threat level is determined to be 'Low'. This level has been derived using the following assessment. The vegetation category with the highest fuel load in proximity to this site is *rainforest*. The slopes in proximity to the site whilst steep, are relatively 'short'. 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 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).

Taking into account the 'Low' threat level and 'Low' vulnerability level, the consequence rating derived at for the site is 'Major'. With a 'major' consequence rating and a 'unlikely' 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.

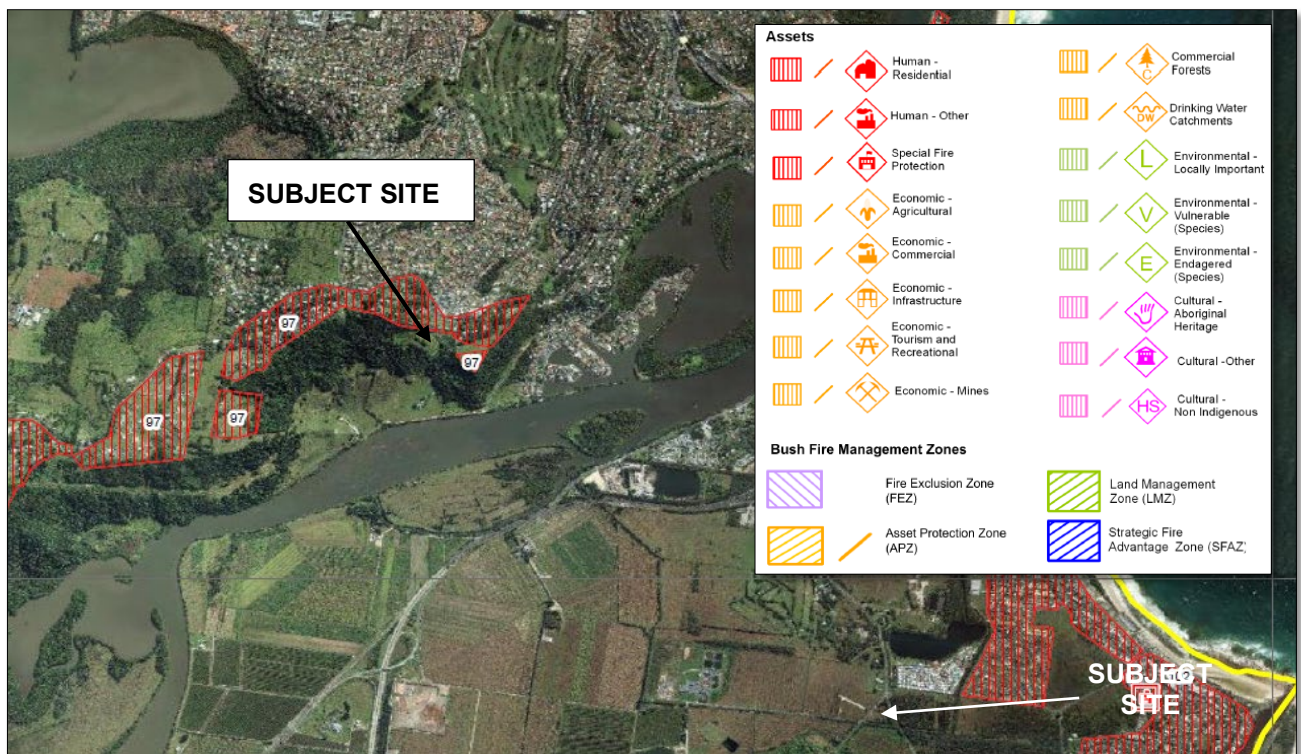


Figure 12: Far North Coast BFRMP 2017

4.7. Strategic bushfire study conclusions

The landscape, vegetation and topographic studies show that this site is subject to a medium bushfire threat which can be mitigated through compliance with PBP 2019 and additional measures which are outlined below. Although the threat is medium, 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 '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:

- ☐ Asset protection zones will be fully contained within future lot boundaries and will not rely on adjoining land;
- ☐ The capacity of the road network is sufficient to deal with the proposed new lots in an emergency situation;
- ☐ A static water supply of 10,000L per lot is recommended; and
- ☐ 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 A1.12.3 of PBP 2019.

Refer to **Table 3** and **Figure 14** for the recommended APZs.

Table 3: Required and Recommended Asset Protection Zones

Transect	Vegetation Formation (PBP 2019)	Slope	PBP 2019 FDI 80 Table A1.12.3
T1	<i>Rainforest</i>	3.0° Downslope	12m
T2	<i>Rainforest</i>	-10.0° (-12.7°) Upslope	9m
T3	<i>Rainforest</i>	-10.0° (-13.0°) Upslope	9m
T4	<i>Rainforest</i>	-10.0° (-20.7°) Upslope	9m
T5	<i>Rainforest</i>	0.9° Downslope	12m
T6	<i>Rainforest</i>	20.1° Downslope	25m
T7	<i>Rainforest</i>	15.6° Downslope	25m
T8	<i>Rainforest</i>	11.6° Downslope	20m
T9	Low threat vegetation	1.5° Downslope	0m
T10	<i>Rainforest</i>	17.8° Downslope	25m

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



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 single access road is provided to service all lots. The proposed road is a safe, all-weather and provide good access to all parts of the site; and a compliant static water supply will be available for emergency services. Secondary access is provided to the larger residue lot from River Road. The secondary access provides direct access to the base of the escarpment but does not continue through to the residential lots due to the steep grade.

There is good circulation around the nominated building envelopes on each lot and any future development application should ensure vehicle paths are provided around the future dwellings.

Overall, it is considered the existing and proposed road provides safe operational access for emergency service personnel and is also appropriate for evacuation purposes for the 3 new residential lots.

5.4. Services - water, electricity and gas

5.4.1. Water

As reticulated water cannot be guaranteed for this development, static water 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 and the future residential lots are 10,000m² or greater, it is recommended static water supply of a minimum 10,000 litres per lot.

All static water supplies should be easily accessible and include firefighting connections in accordance with PBP 2019. Fire hydrant spacing, sizing and pressure should comply with AS 2419.1 – 2005. Hydrants are not to be located within any road carriageway.

5.4.2. Electricity

All electricity services will connect to the existing overhead lines and laid underground from the street to each lot.

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 residential 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 = *rainforest*; and
- ☐ Building location.

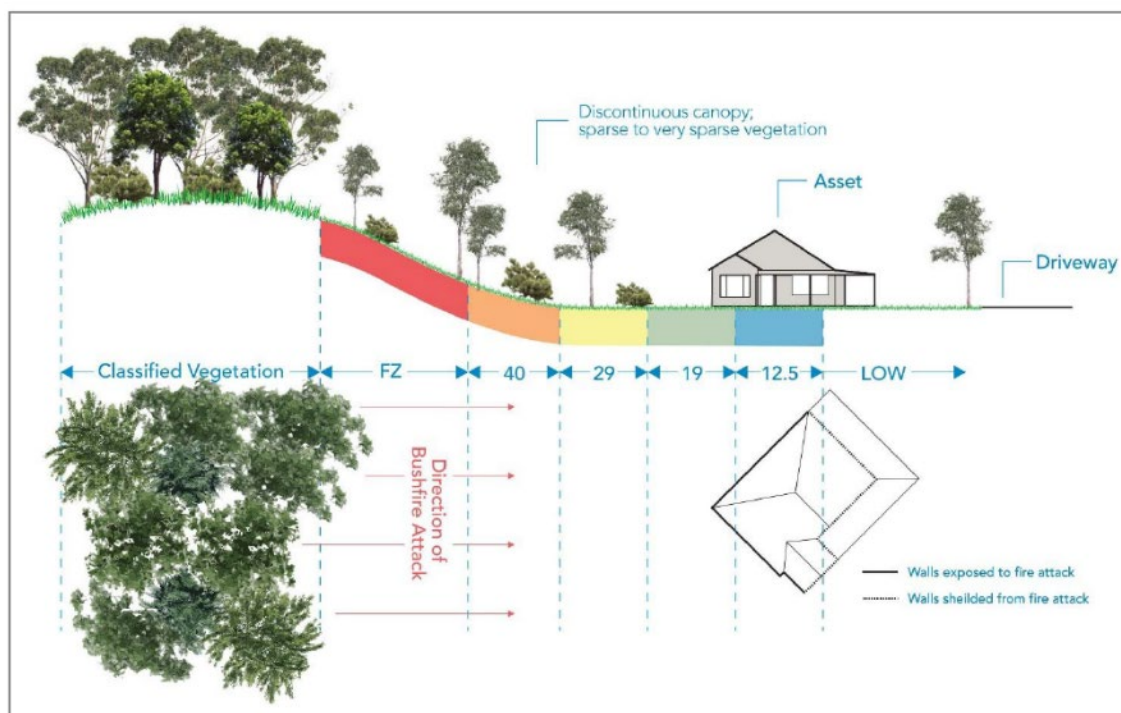
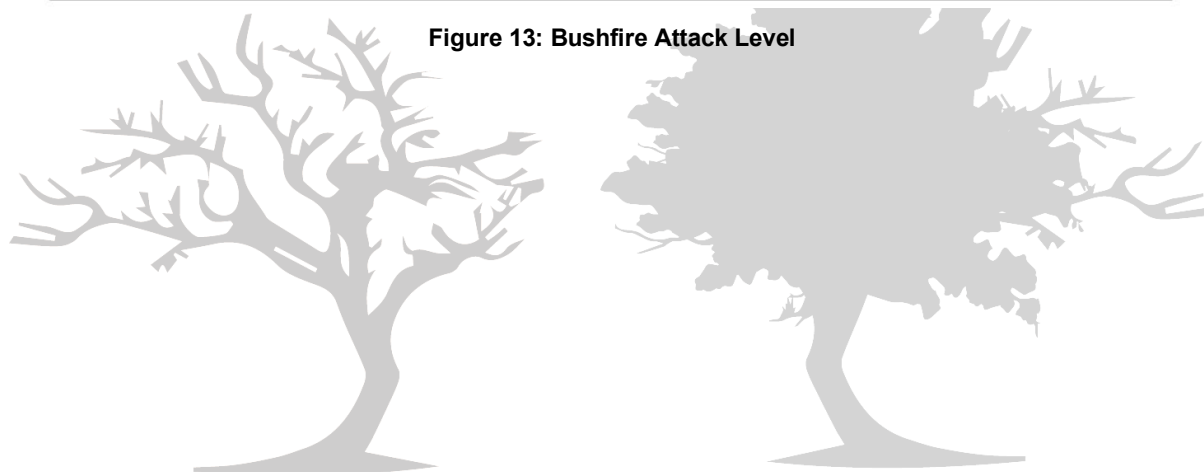


Figure 13: Bushfire Attack Level



225 Terranora Road,
Banora Point 2486

Figure 14

Recommended Asset Protection Zones



BUSHFIRE
PLANNING
AUSTRALIA

- Subject Site
- 140m Buffer
- 100m Buffer
- Proposed Lots
- Building Envelope
- Access Driveway
- Recommended Asset Protection Zone

SOURCE:

Cadastral Boundary: NSW Department of Finance,
Services and Innovation 2021
Aerial Photo: Nearmap 06/06/21



0 20 40 60 80
Meters

A3 Scale: 1:1,500

File:BanoraPoint-Fig11-Recommended-APZ-230405

Date: 5/04/2023

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6. Conclusion and Recommendations

Bushfire Planning Australia has been engaged by Alan Hope to undertake a Strategic Bushfire Study and Bushfire Assessment Report for the proposed rezoning and residential subdivision of 225 Terranora Road, Banora Point.

This SBS finds the site exposed to a medium bushfire hazard to the south and a moderate bushfire hazard to the west. The predominant vegetation surrounding the site is consistent with a *rainforest* vegetation formation 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.

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:

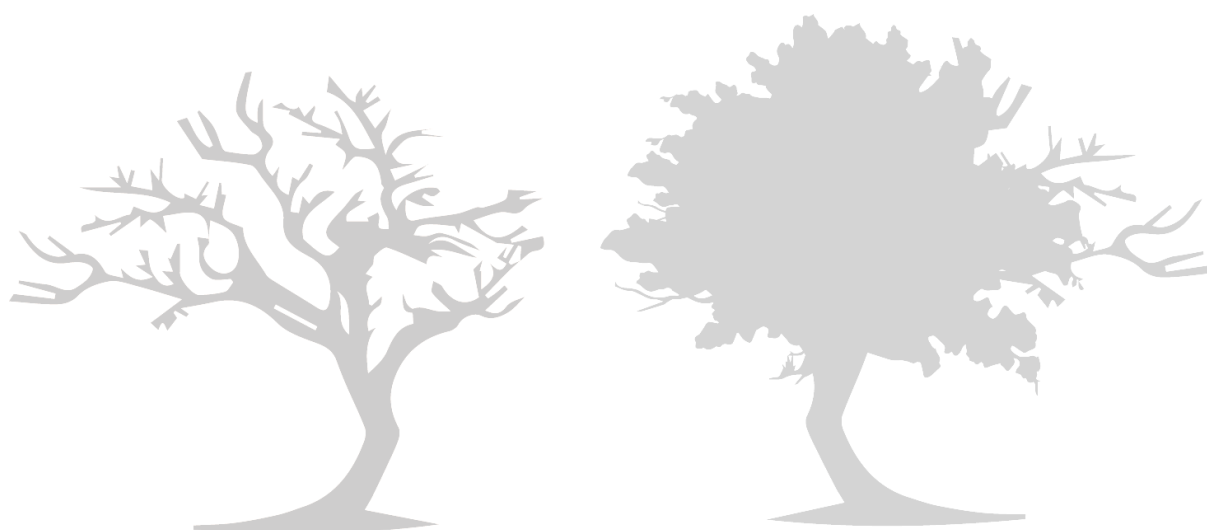
1. The entire site to be zoned R5 Large Lot Residential shall be managed as an Inner Protection Area (IPA) as outlined within Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;
2. Asset Protection Zones shall be established as shown in **Figure 14** and maintained as outlined Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones.
3. Access shall be provided in accordance with concept plan;
4. 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;
5. A static water supply of 10,000L per residential lot is to be provided with appropriate equipment and connections complying with section 5.3.3 of PBP 2019; and
6. Consideration should be given to landscaping and fuel loads on site to decrease potential fire hazards on site.

This assessment has been made based on the bushfire hazards observed in and around the site at the time of inspection and production (April 2023).

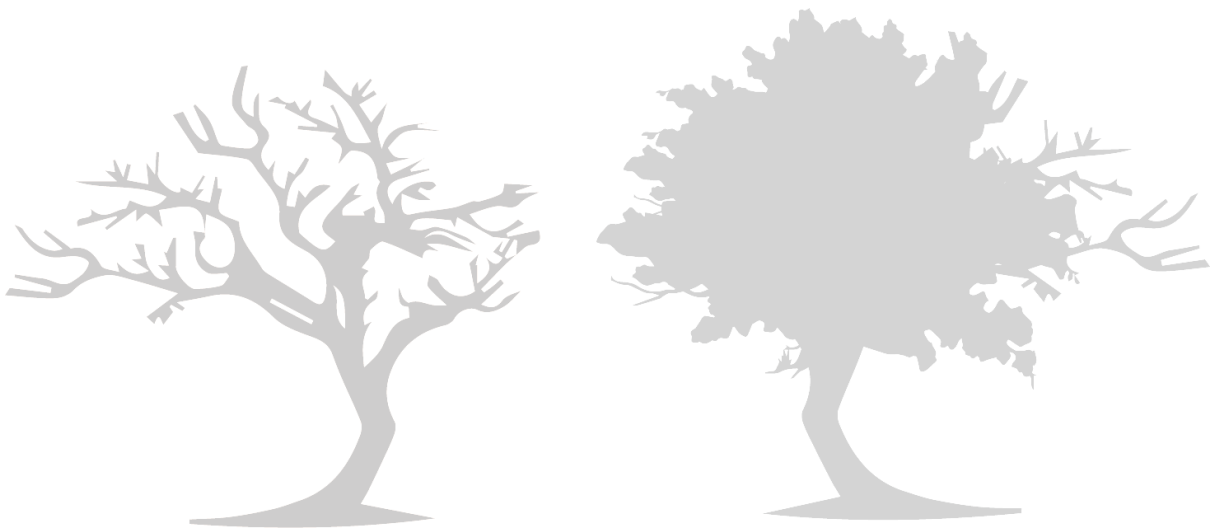
Should the above recommendations be implemented, the existing bushfire risk should be suitably mitigated to offer an acceptable level of protection to life and property for those persons and assets occupying the site but they do not and cannot guarantee that the area will not be affected by bushfire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

7. References

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- ❑ 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 Subdivision



Appendix B: AHIMS Search Results



Katrina Greville

Date: 04 April 2023

21 Costata Crescent

Adamstown New South Wales 2289

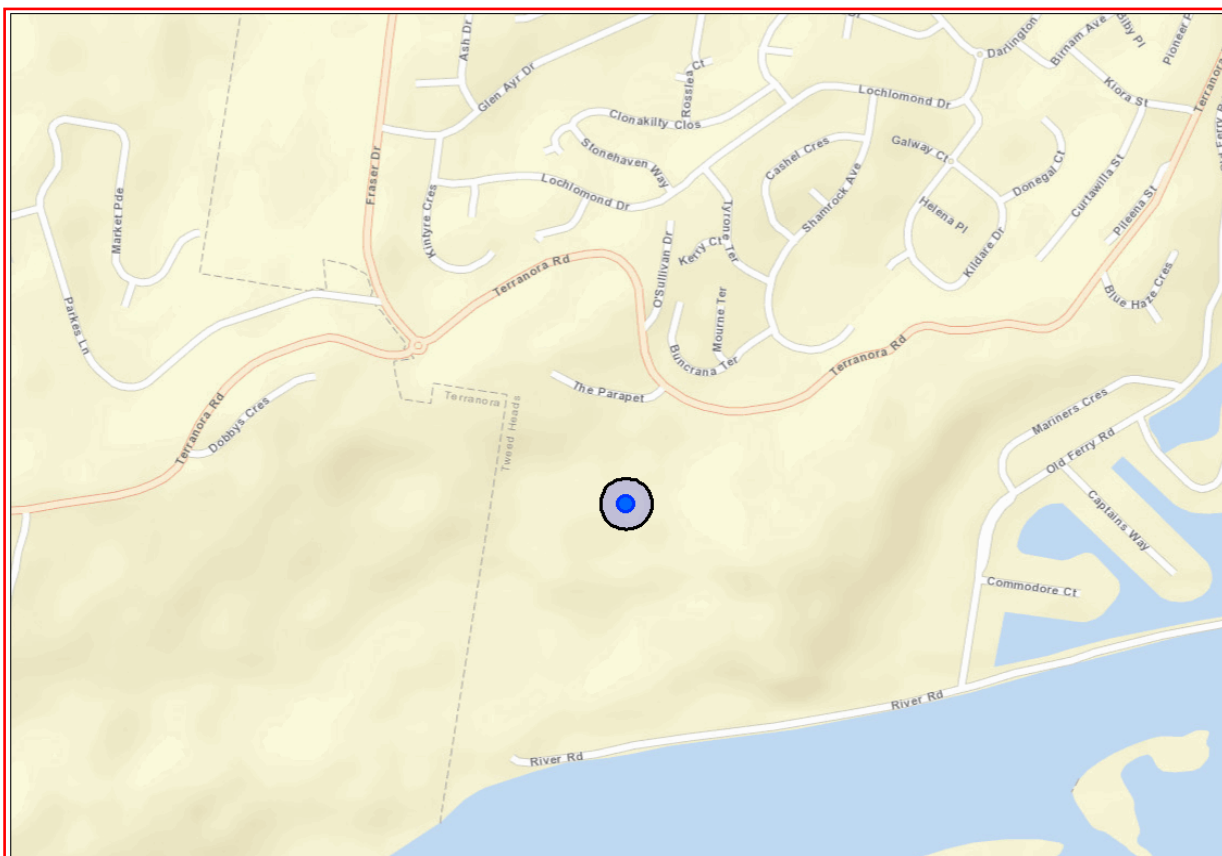
Attention: Katrina Greville

Email: klmukevski@bigpond.com

Dear Sir or Madam:

AHIMS Web Service search for the following area at Address : 225 TERRANORA ROAD BANORA POINT 2486 with a Buffer of 50 meters, conducted by Katrina Greville on 04 April 2023.

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 Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

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

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 \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW 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 Heritage NSW 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.