



# BUSHFIRE ASSESSMENT REPORT

GOOGONG TOWNSHIP  
NEIGHBOURHOODS 3, 4, 5

Prepared for Googong Township Pty Ltd

14 September 2021

Ref: JD.66.21.



## *DOCUMENT CONTROL*

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<b>Approved by:</b>	Jeffrey Dau (BPAD – 33128)

## *EXECUTIVE SUMMARY*

EMBER Bushfire Consulting and Mackenzie Davey Consulting have been engaged by Googong Township Pty Ltd to prepare a bush fire assessment of the DA associated with the residential subdivision of Googong Neighbourhoods 3, 4 and 5.

Googong Neighbourhoods 3, 4, 5 represents the final phase of the Googong township expansion to the south of the existing neighbourhoods 1 and 2.

The proposed subdivision contains and is in proximity to bushfire prone land as declared by the Queanbeyan Palerang Regional Council. This assessment adopts a methodology provided under the requirements of Section 100B of the Rural Fires Act and the Rural Fire Regulations 2013 to assess the adequacy for bushfire protection of the subdivision as planned.

This report establishes the level of bushfire threat to the proposed development and examines bushfire protection for measures such as asset protection, access and services.

While vegetation across the site presents as open grassland, with scattered paddock trees and small pockets of remnant woodland, a highly conservative approach has been taken for hazard analysis where the vegetation classification is aligned with Plant Community Type Vegetation Zones identified in the biodiversity study. This takes into account in potential future hazard vegetation state.

This threat can be moderated given the standard suite of protection measures offered by PBP 2019 and for which the proposed development can largely comply.

The future development provides good space for the establishment and maintenance of the required APZs.

Planned access throughout the subdivision is well provided for and given that future roads will apply the standards and specifications set out with PBP (2019) will largely comply with the acceptable solutions provided.

Planned services throughout the subdivision are to meet the standards and specifications set out with PBP (2019) and will be capable of complying with the acceptable solutions.

Based on the assessment and the recommendations contained in this report the proposed development is deemed capable of complying with the specific and broad objectives of PBP (2019), the requirements of the Rural Fire regulations (2013) and therefore suitable for submission to the NSWRFs for the issuing of a bush fire safety authority.

## KEY DETAILS OF DEVELOPMENT

Information	Detail
Lot & DP Number	Lot 6 and 7 DP 1246784 Lot 10, 11, and 42 DP 754881 Lot 2 DP 1231713 Lot 901 DP 1242930 Lot 1 DP 1231713.
Street Address	Old Cooma Road Googong
Local Government Area	Queanbeyan Palerang Regional Council
Zoning of subject land	E2 – Environmental Conservation RE2 – Private Recreation R1 – General Residential R5 – Large Lot Residential
Zoning of adjoining lands	E2 – Environmental Conservation E4 – Environmental Living R1 – General Residential R5 – Large Lot Residential
Staging issues	Nil
Development classification	Residential subdivision
Type of assessment	100B for Bushfire Safety Authority
Fire weather area	Southern Ranges
Fire Danger Index	100
Predominant vegetation	Grassland / Woodland / Forest
Slope	Ranging from upslope to 11° downslope
Environmental constraints	Typical Biodiversity Off Set Constraints
Cultural constraints	Nil known



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# 1 INTRODUCTION AND OVERVIEW

## 1.1 BACKGROUND

EMBER Bushfire Consulting and Mackenzie Davey Consulting have been engaged by Googong Township Pty Ltd (GTPL) to prepare a bushfire assessment report of the multi lot residential subdivision of Googong Neighbourhoods 3, 4 and 5 (NH345). The development represents the final phase of the Googong township expansion to the south of the existing Neighbourhoods 1 and 2.

The development proposal is located on land declared bushfire prone by Queanbeyan Palerang Council and as a result is subject to Division 4.8 of the Environmental Planning and Assessment Act (1979) (EP&A Act) and Section 100B of the Rural Fires Act (1997).

Under the Rural Fires Act (1997) the development proposal must be shown to conform with the broad aim and objectives of the NSW Rural Fire Service (NSW RFS) document Planning for Bushfire Protection (2019) (PBP 2019). and therefore, is the key reference document for this assessment.

## 1.2 AIM AND OBJECTIVES OF THIS REPORT

The aim of this report is to:

- Evaluate the potential bushfire threat to NH345.

- Assess the capacity of the proposed subdivision to provide the minimum bushfire protection necessary to offer life safety to the occupants, improve property protection and facilitate fire service intervention during a bushfire event.
- Assess the capacity of the proposed subdivision to achieve the relevant performance criteria using the acceptable solutions provided in PBP 2019.

The specific objectives required of the proposed development are detailed in Chapter 5 – Residential and Rural Residential Subdivisions PBP 2019 and include:

- minimise perimeters of the subdivision exposed to the bush fire hazard;
- minimise vegetated corridors that permit the passage of bush fire towards buildings;
- provide for the siting of future dwellings away from ridge-tops and steep slopes, within saddles and narrow ridge crests;
- ensure that APZs between a bush fire hazard and future dwellings are effectively designed to address the relevant bush fire attack mechanisms;
- ensure the ongoing maintenance of APZs;
- provide adequate access from all properties to the wider road network for residents and emergency services;

- provide access to hazard vegetation to facilitate bush fire mitigation works and fire suppression; and
- ensure the provision of an adequate supply of water and other services to facilitate effective firefighting.

Accordingly, the following bushfire protection measures are to be assessed:

- Asset Protection Zones (APZs)
- Landscaping
- Access
- Water, Electricity and Gas Supplies (Services),
- Construction and other protection requirements, and
- Emergency Management.

### 1.3 LIMITATIONS AND DISCLAIMER

This report is primarily concerned with assessing the capacity of the proposed development to withstand the impacts of a bushfire including, ember attack, radiant heat and flame contact.

Where necessary, protection measures will be recommended to provide a satisfactory level of protection to the occupants and the structures themselves.

It should be kept in mind that the measures prescribed cannot guarantee that the proposed development will survive a bushfire event on every occasion. This is primarily due to the reliance on vegetation management, the unpredictable behavior of fire, and extreme weather conditions.

EMBER Bushfire Consulting and Mackenzie Davey Consulting have prepared this report with all reasonable diligence. The information contained in this report has been gathered from field investigations of the site as well as plans provided by the developer.

Table 1 - Stakeholders

Stakeholder	Role	Contact	Detail
GTPL	Proponent	Tim Corby	0488 242 846
Urbane	Planning consultants	Giselle Ravarian	6262 6363
Queanbeyan Palerang Regional Council	Consent Authority	Not Given	1300 735 025
NSWRFS	Consent Authority	Not Given	02 475 1300

## 1.4 PROJECT OVERVIEW

Googong Township is a 25-year project being developed in partnership by Peet and Mirvac, operating as Googong Township Pty Ltd (GTPL). The emerging township is located in Southern NSW, 8km from Queanbeyan and 15km from Canberra.

The Googong master plan is embedded in Queanbeyan-Palerang Regional Council's (QPRC) Googong Development Control Plan and provides the overarching structure for the township. It has been planned and is being developed as a freestanding township with five neighbourhoods, around 6,600 dwellings and a population of over 18,000 people over 25 years.

Neighbourhood's 1 and 2 (also known as Googong North and Googong Central) have completed Structure plans and DAs. Neighbourhood 2 is currently under staged construction.

The next 3 Neighbourhoods to be developed, under the next Development Application, are

- Neighbourhood 3 (including the Hamson land) – also known as Googong West
- Neighbourhood 4 – also known as Googong South, and
- Neighbourhood 5 – also known as Googong East.

## 1.5 PROJECT OBJECTIVE

GTPL are seeking to submit a Development Application (DA) with QPRC for the subdivision of the land within Neighbourhoods 3, 4 & 5 (NH345).

The DA proposal seeks approval for:

- Torrens title subdivision of Neighbourhoods 3, 4 and 5 to create:
  - 1476 residential lots
  - 20 residual lots for future subdivision of higher density housing and other uses including the Neighbourhood Centre sites, to accommodate approximately 320 dwellings
  - public reserves including, local parks, a sports fields and Googong Common
  - public roads and drainage reserves.
- All subdivision works to prepare the land for the future development comprising site preparation and grading, stormwater and drainage works, road construction, tree removal, public domain landscaping and structures and utilities provision. The subdivision of the higher density super lots and the construction of all buildings (housing, recreational facilities, and schools) as well as the Neighbourhood Centre sites will be subject of future applications.

## 1.6 NH 345 LOCATION AND CONTEXT

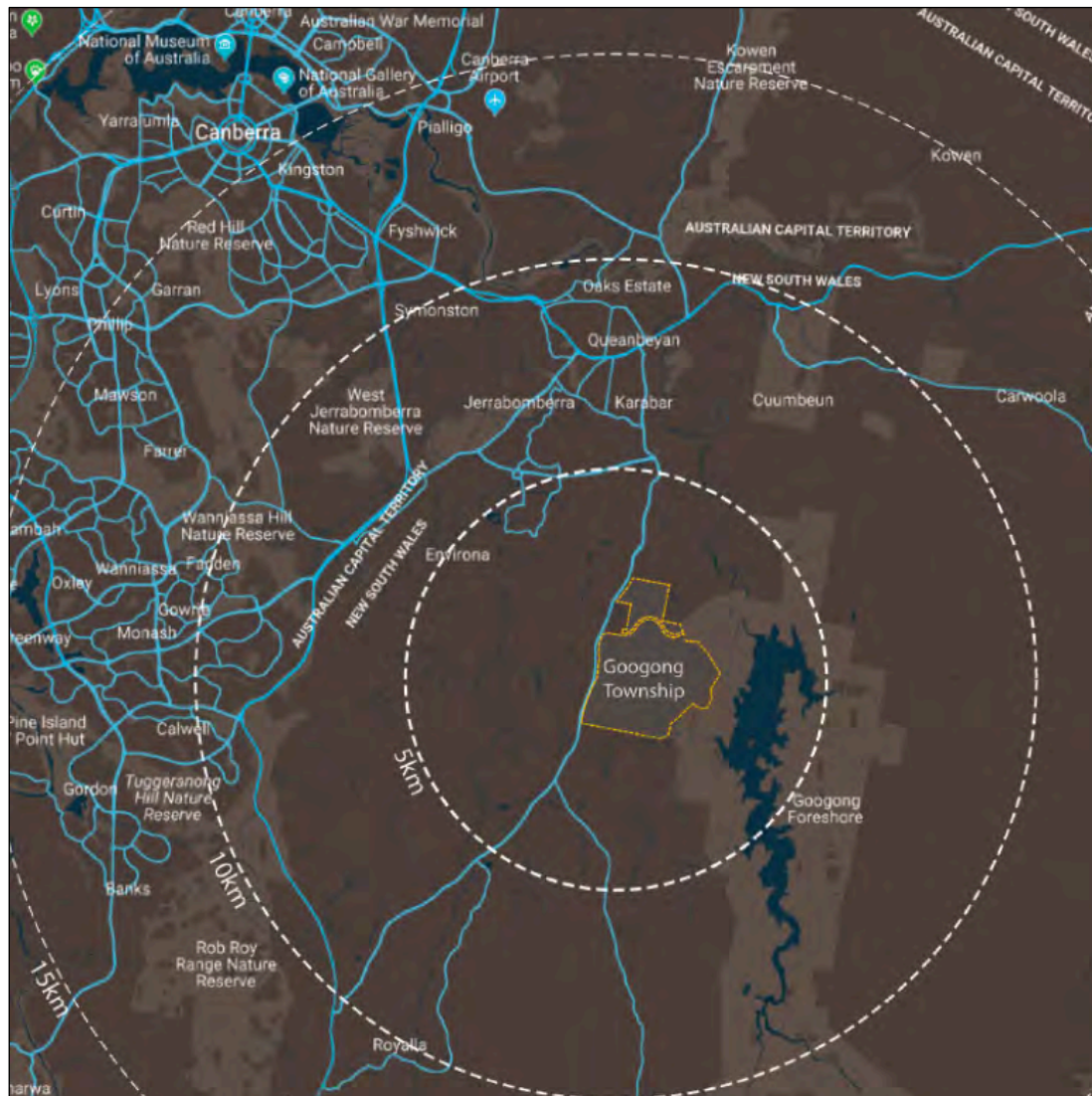


Figure 1 - Subject site regional context (GTPL, 2021)

Googong Township NH345 is in the Southern Tablelands of NSW, 9 km due south of Queanbeyan and 20 km southeast of Canberra City (Figure 1).

The ~235 Ha site falls within the administration area of the Queanbeyan Palerang Regional Council (QPRC).

The subject site is bounded by Old Cooma Road to the west, Googong Township Neighbourhood 1B and 2 to the north, the Googong Dam foreshore, and Pink Tail Worm-Lizard Conservation Area to the east and rural land to the south.

The area around Googong is characterised by rural uses, while NH345 itself is characterised as former agricultural land.

The site is currently zoned as Zoned as RE1 – Public Recreation, R1 – General Residential, R5 – Large Lot Residential and E2 – Environmental Conservation.

NH345 is currently set amongst set open grassland with small pockets of woodland dispersed throughout.



## 1.7 SUBJECT SITE DESCRIPTION

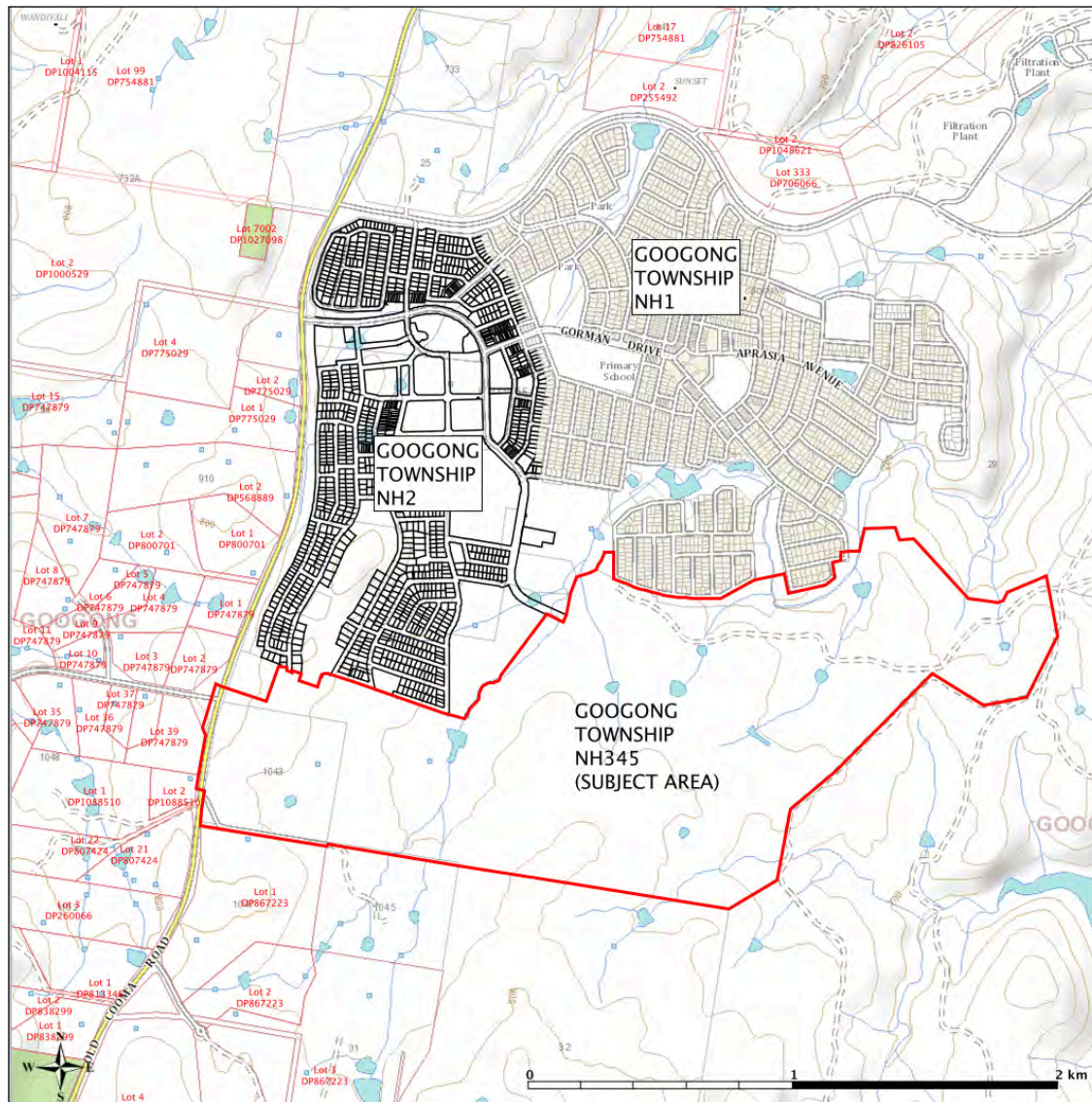


Figure 2 - Subject site local context (FireMaps, 2021)

Terrain across the Googong development area is undulating, although further afield are some steep gullies associated with drainage lines into Googong reservoir.

While vegetation across the site presents as open grassland, with scattered paddock trees and small pockets of remnant woodland, a highly conservative approach has been taken for hazard analysis where the vegetation classification is aligned with Plant Community Type (PCT) Vegetation Zones identified in the biodiversity study (Figure 5).

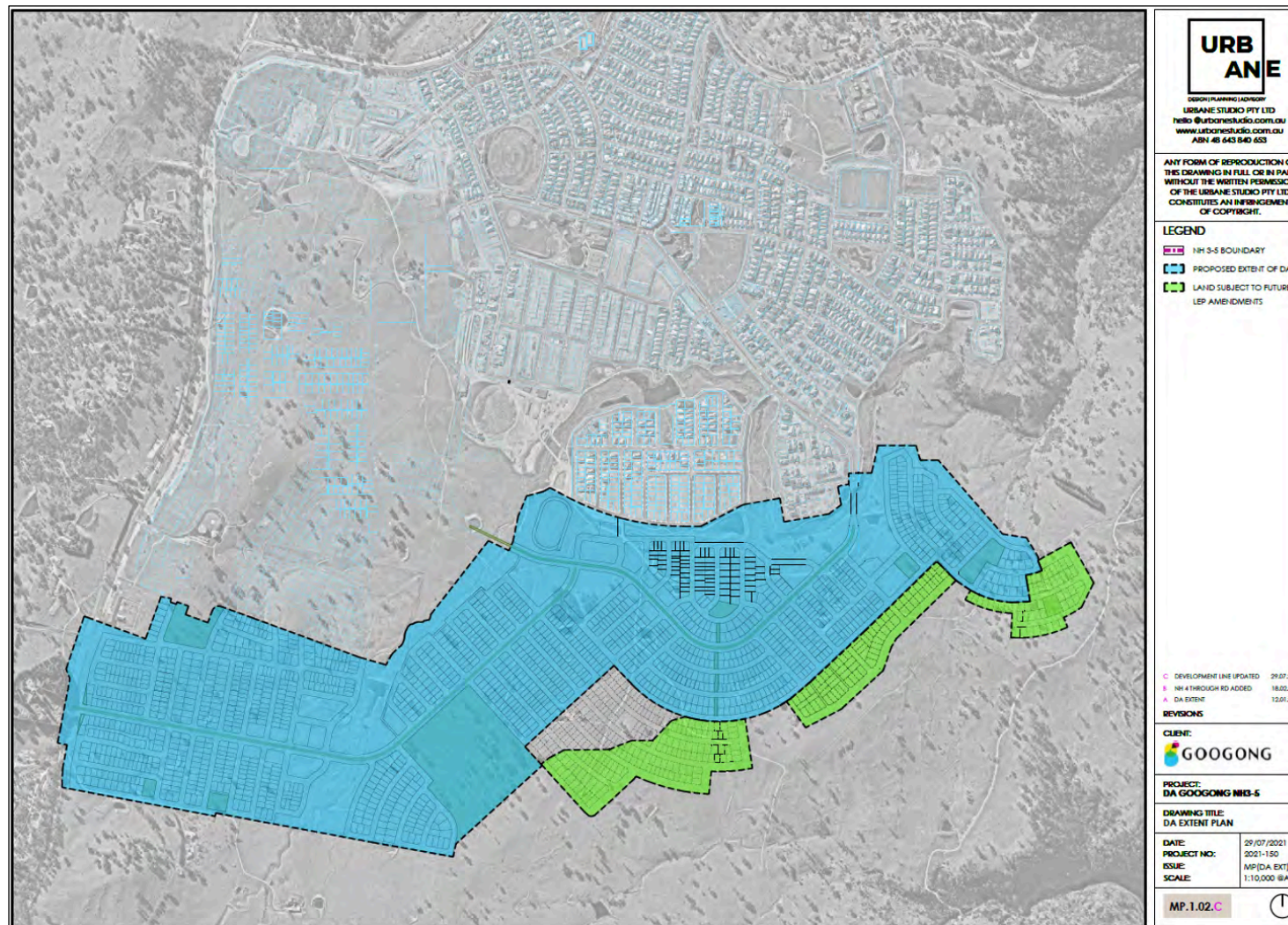
Access to and from the subject site is via both direct access to Old Cooma Road to the west and through the Googong Neighbourhoods 1 and 2 to the north.

The proposal is designed with an interconnected road network including perimeter roads and multiple connection points with Googong Neighbourhoods 1 and 2 enabling through road access for the estate.

Emergency Access is proposed into the Googong dam foreshore reserve, managed by the ACT Government, at two points to allow for maintenance and firefighting activities.



## 1.8 DEVELOPMENT PROPOSAL



**Figure 3 – Googong 3,4, 5 DA extent plan (Urbane, 2021)**

The development area extends south of the existing approved Googong Neighbourhoods 1 and 2 indicated by blue areas.

Land further south maybe the subject of subsequent development applications indicated by green areas but is not currently part of the Googong masterplan (figure 3).

Developed areas outside the subject site have been subject to previous rezoning and DA approvals, including a Bushfire Fire Safety Authority from the NSW RFS and therefore are outside of the scope of this assessment.

## 2 ASSESSING THE BUSHFIRE THREAT

### 2.1 METHODOLOGY

The methodology adopted to prepare this report is as follows:

Table 2 - Report methodology

Method	Task	Considerations
<b>Desktop analysis</b>	Review available mapping resources, policy documents & development plans	Online Maps Development Control Plans Local Environmental Plan
<b>Site inspection</b>	Evaluate context of site, determine bushfire threat, options for asset protection zones, access roads and infrastructure.	Ground truth online mapping data, validate vegetation class, obtain site measurements, assess existing structures and infrastructure.
<b>Assessment of proposal against the NSW RFS Planning for Bushfire Protection (PBP 2019).</b>	Assess the development proposal against the performance criteria of PBP 2019.	Does the proposal comply with the performance criteria provided under of PBP 2019.
<b>Report</b>	Preparation and publication of bushfire assessment report	Demonstrate the proposal is capable of meeting the aims and objectives of PBP 2019.

### 2.2 GENERAL BUSHFIRE ENVIRONMENT

To determine the potential bushfire threat posed to the subject site, the following environmental factors are adopted across the site.

Table 3 - Bushfire behaviour factors

Factor	Value
<b>Fire Weather Area</b>	Southern Ranges
<b>FDI</b>	100
<b>Predominant Vegetation Classification</b>	Grassland Grassy Woodlands, and Forest
<b>Slope</b>	Ranging from upslope to 11° downslope.

*Note: A detailed bushfire hazard analysis is detailed below.*

- *Vegetation formations within 140 m of the subject site are classified in accordance with Plant Community Type (PCT) mapping.*
- *Slopes out to 100 m from planned APZs and / or lot boundaries have been assessed in accordance with A1.4 & A1.5 of PBP 2019. Elevation profiles are provided in Attachment D Supporting Information*
- *The fire danger index for the site has been determined in accordance with the NSW Rural Fire Service.*
- *A bushfire threat analysis is provided in Section 3 of this report. Detailed Method 2 fire modelling is provided as an attachment under Attachment C Fire Modelling.*

## 2.3 SUBJECT SITE BUSHFIRE PRONE MAPPING

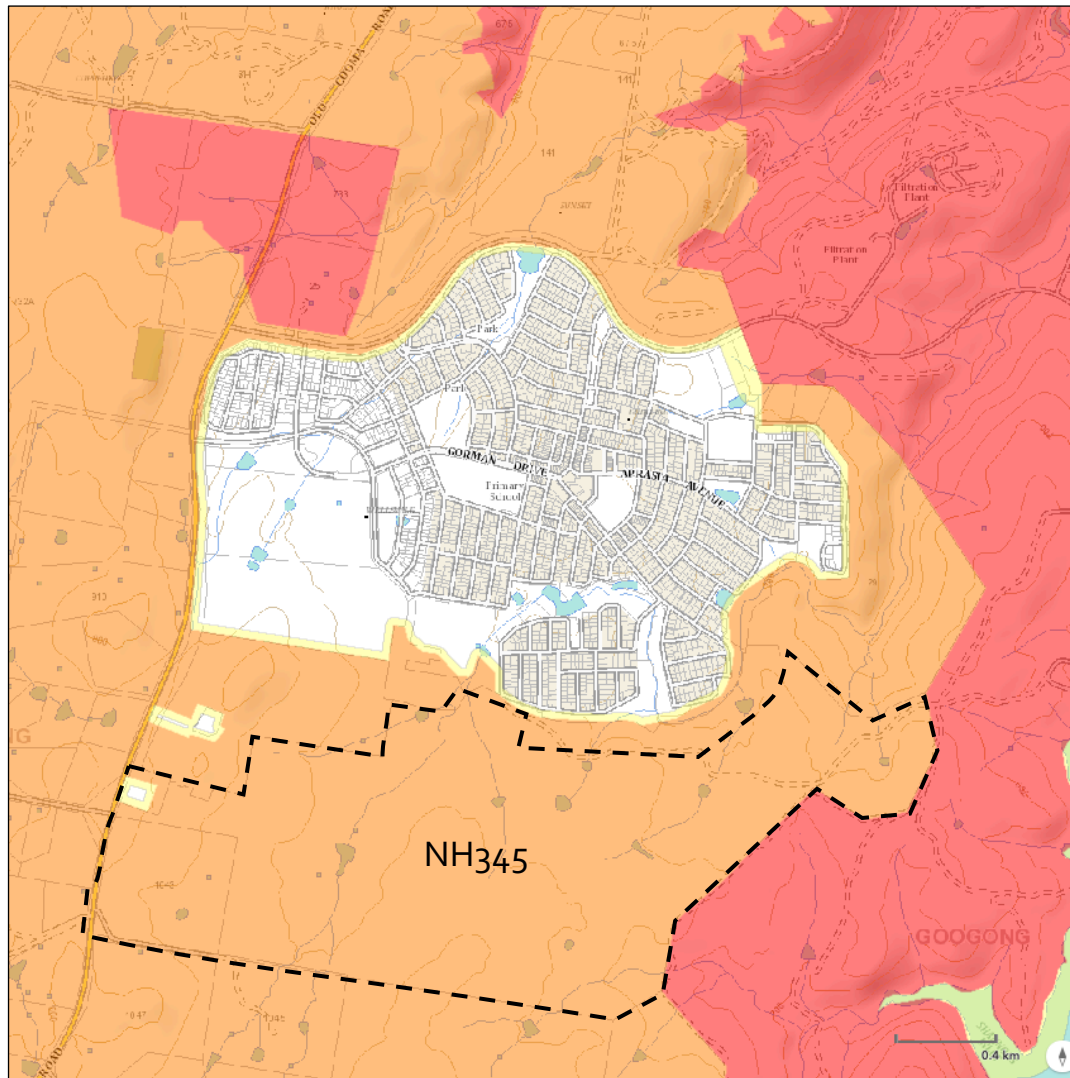


Figure 4 – NH345 Bushfire Prone Land Map. (NSW Planning Portal, 2021)

Bushfire prone mapping relative to NH345 (Figure 4) showing the proximity of adjacent Vegetation Category 2 and Vegetation Category 1 within the bounds of the DA extent as declared by the QPRC Bushfire Prone Mapping.

Note: The mapping does not take into account land use changes, i.e. recent urban development in the area which may alter the validity of the mapping as it is currently published.

Hazard classification key:

### Hazard

#### Bushfire Prone Land

- Vegetation Category 1
- Vegetation Category 2
- Vegetation Category 3
- Vegetation Buffer



## 2.4 VEGETATION CLASSIFICATION

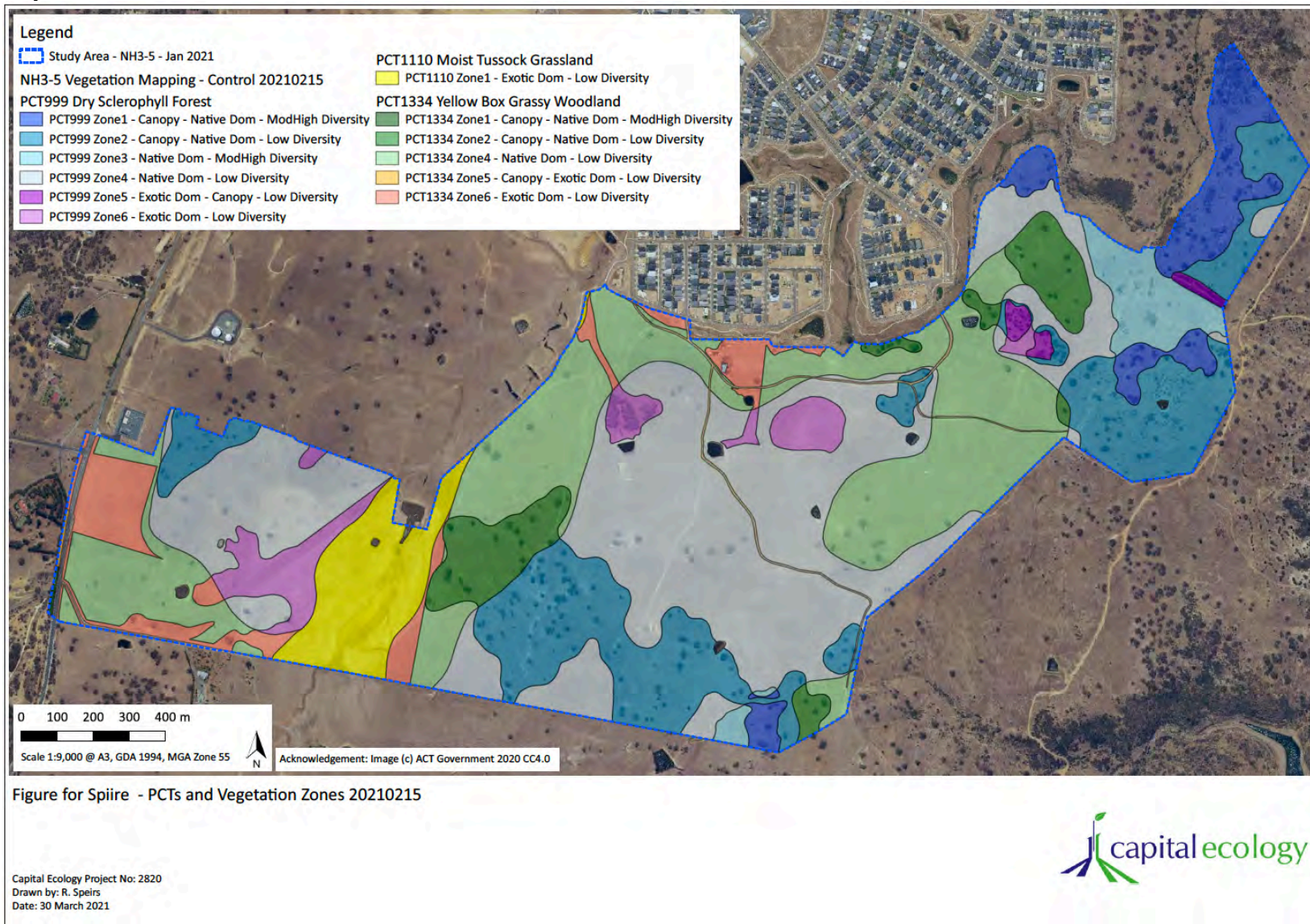
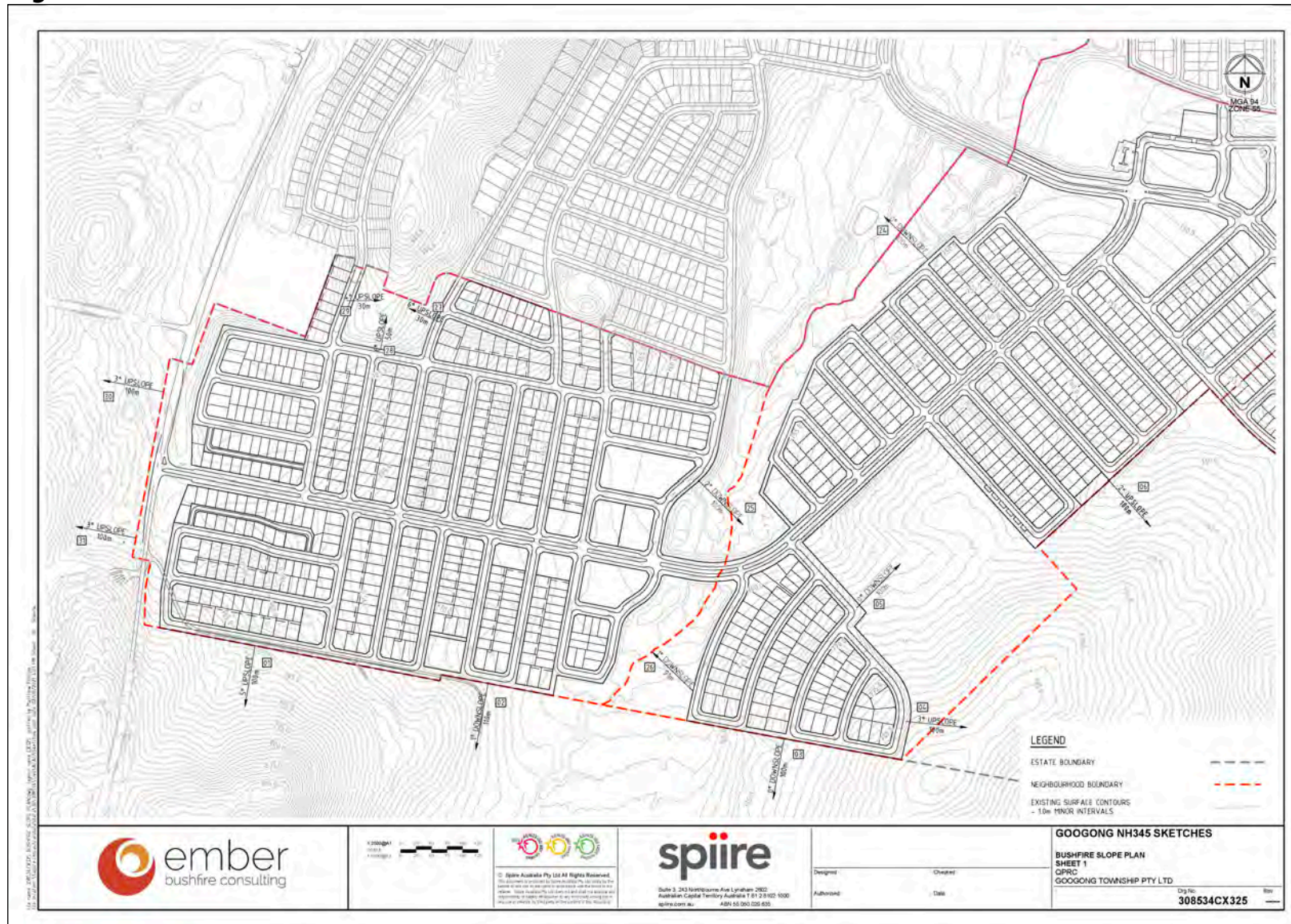


Figure 5 – Plant Community Type Vegetation Zones. (Capital Ecology, 2021)



## 2.5 SLOPE ANALYSIS





## SLOPE ANALYSIS

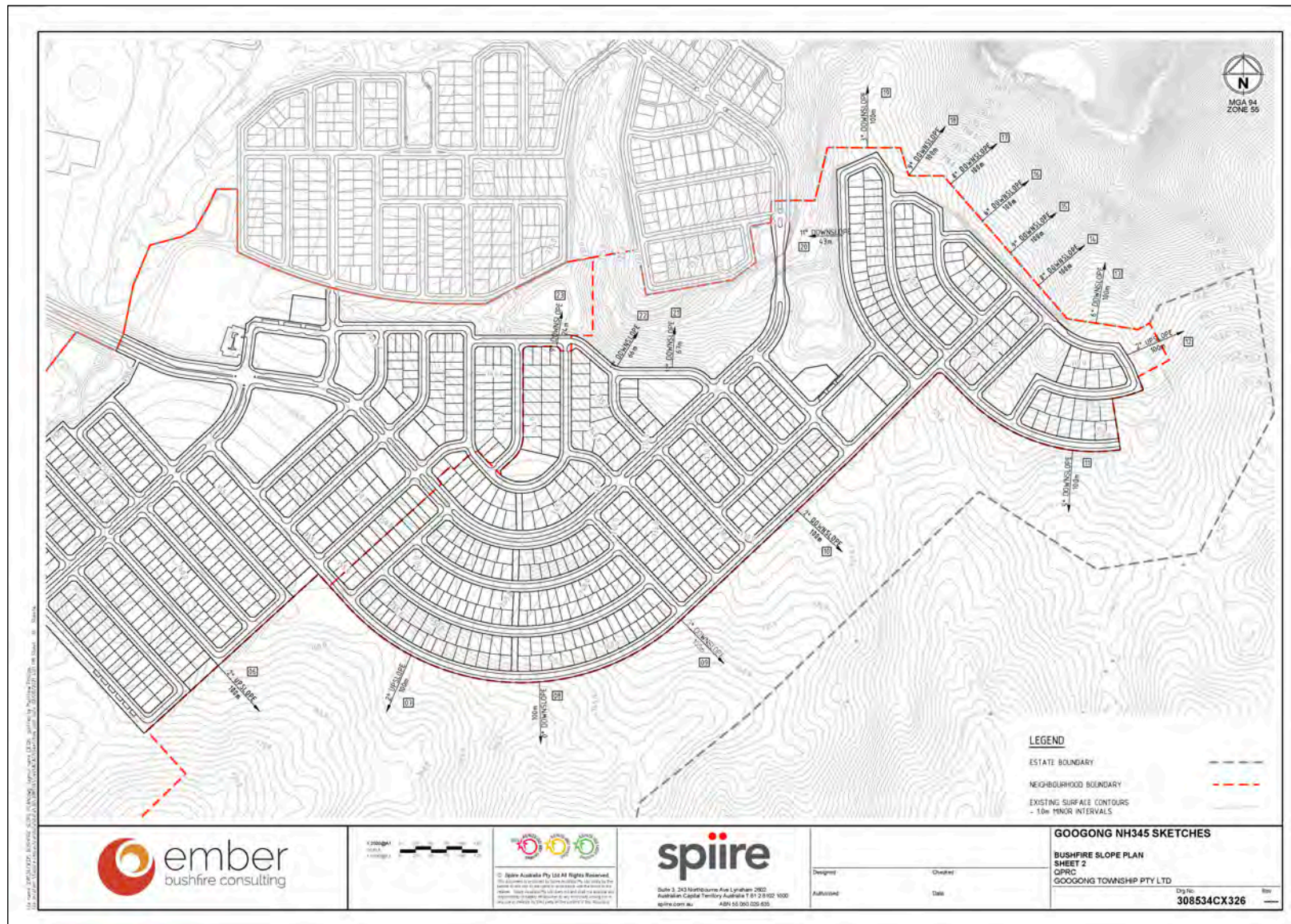


Figure 7 – NH 2 & 3 slope analysis. (Ember & Spiire, 2021)



## 2.6 VEGETATION AND SLOPE MAPPING



Figure 8 – NH 1 vegetation and slope mapping. (Ember & Spiire, 2021)

## VEGETATION AND SLOPE MAPPING

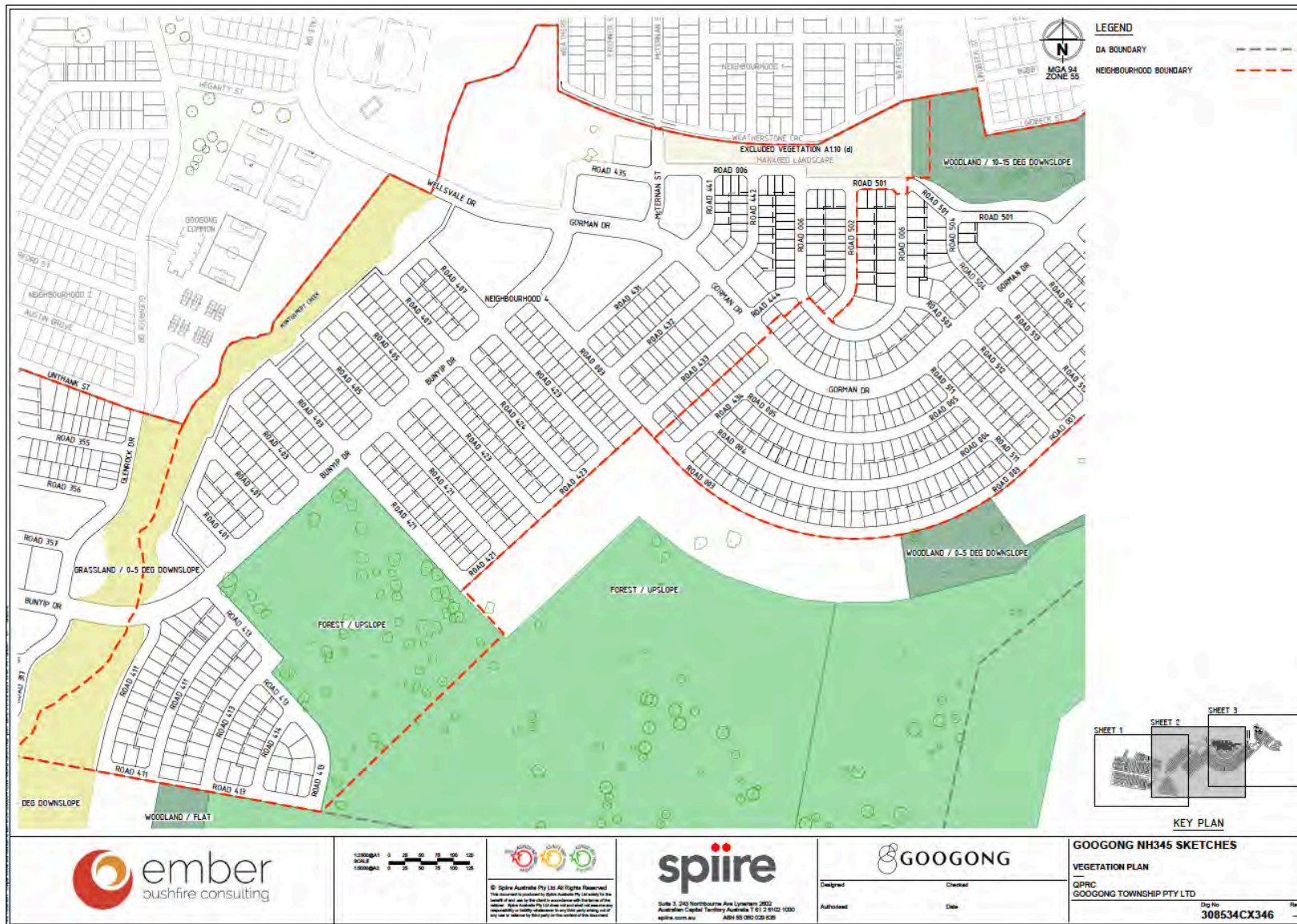


Figure 9 – NH 2 vegetation and slope mapping. (Ember & Spiire, 2021)



## VEGETATION AND SLOPE MAPPING

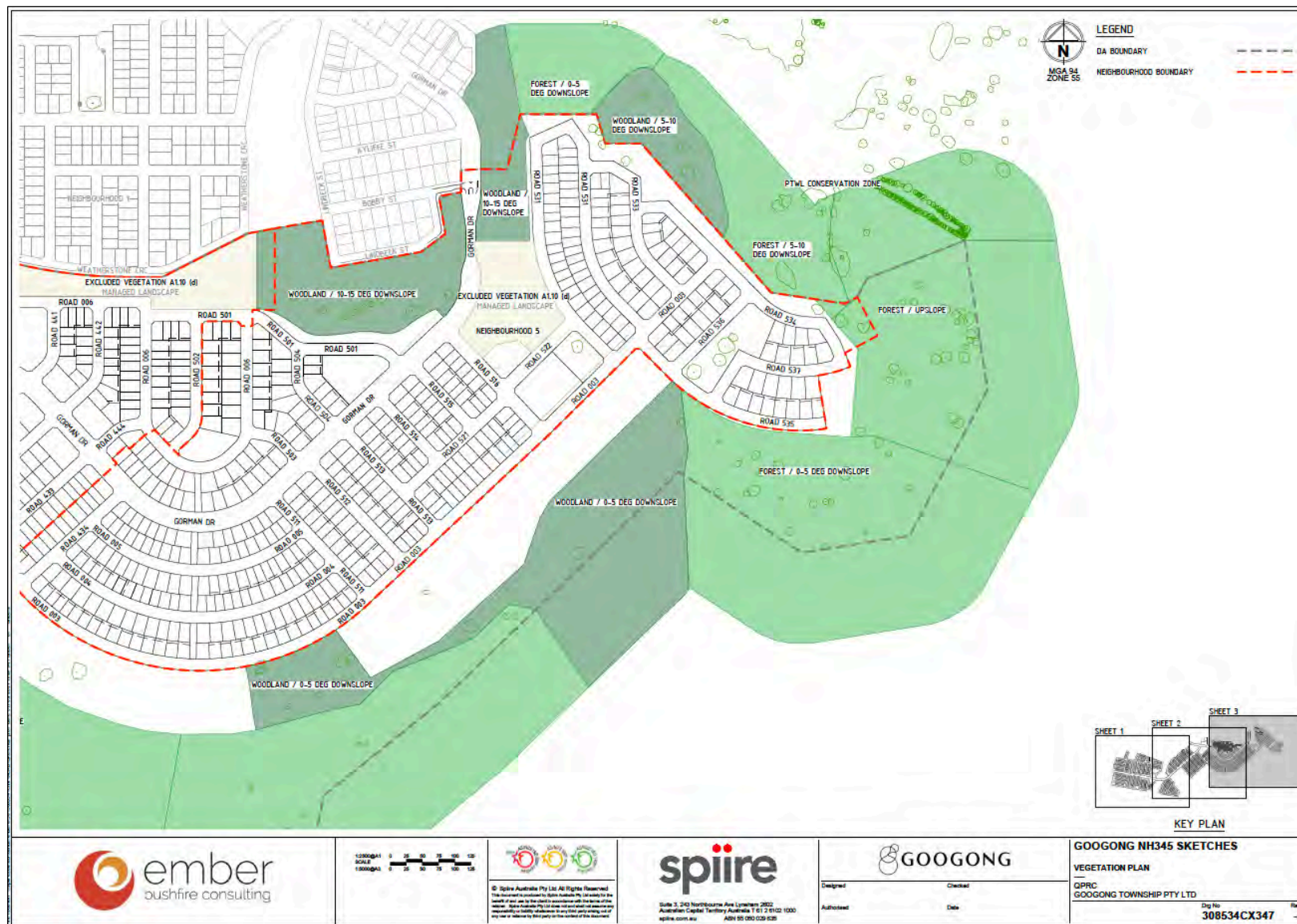


Figure 10 – NH 3 vegetation and slope mapping. (Ember & Spiire, 2021)



## 2.7 ASSET PROTECTION ZONE PLAN

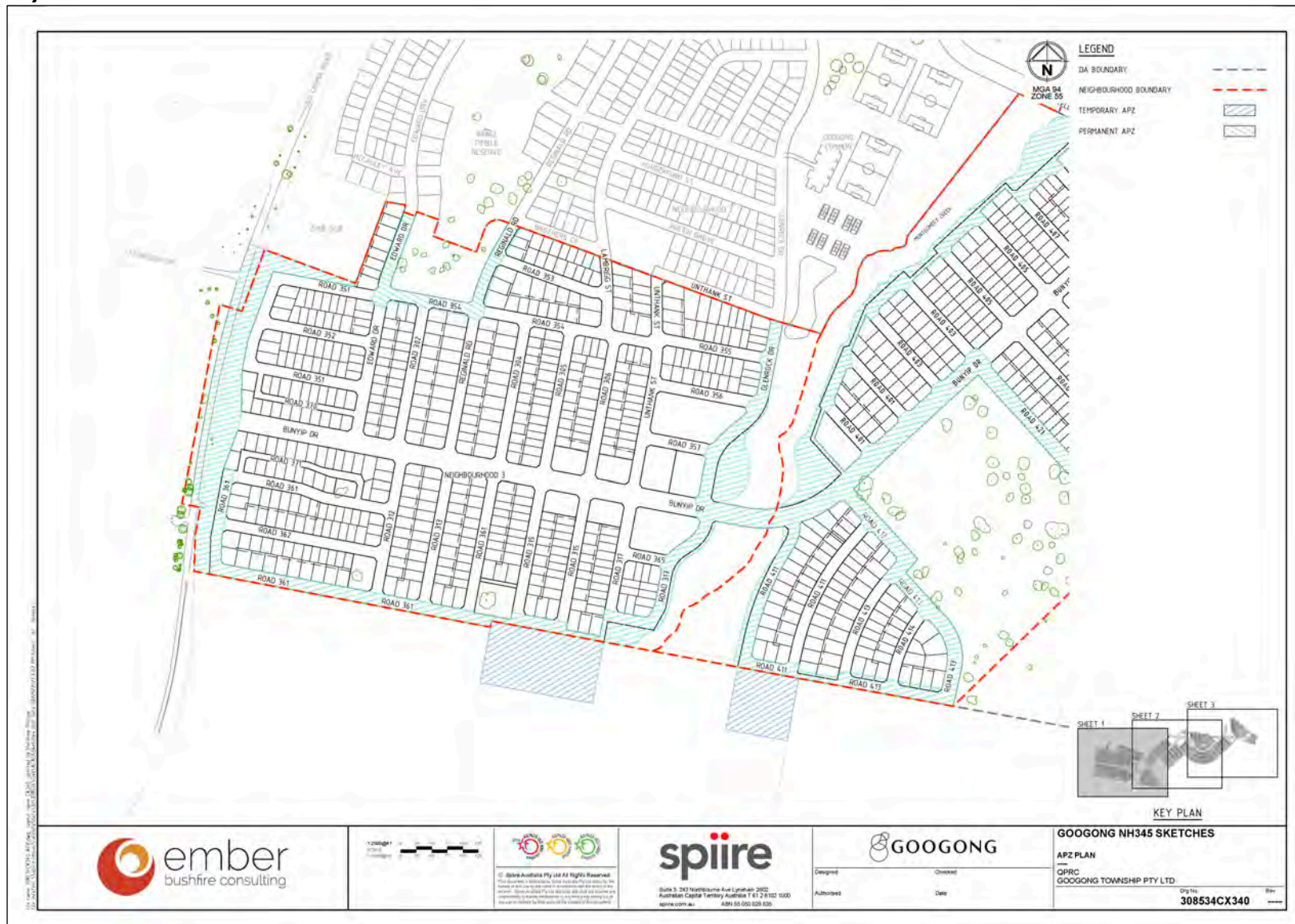


Figure 11 –APZ plan for NH 1. (Ember & Spiire, 2021)

# ASSET PROTECTION ZONE PLAN

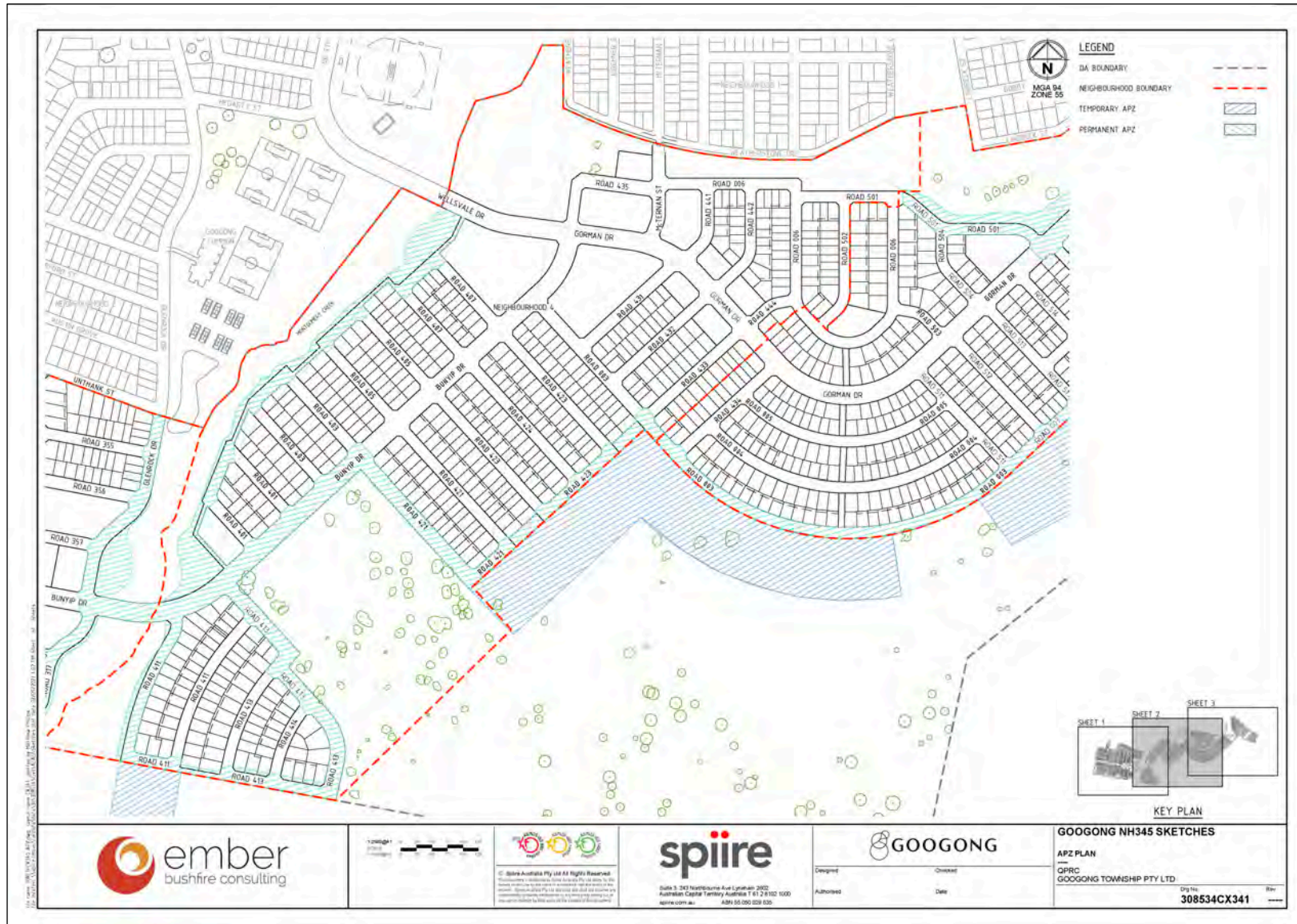


Figure 12 – APZ plan for NH 2. (Ember & Spiire, 2021)



## ASSET PROTECTION ZONE PLAN

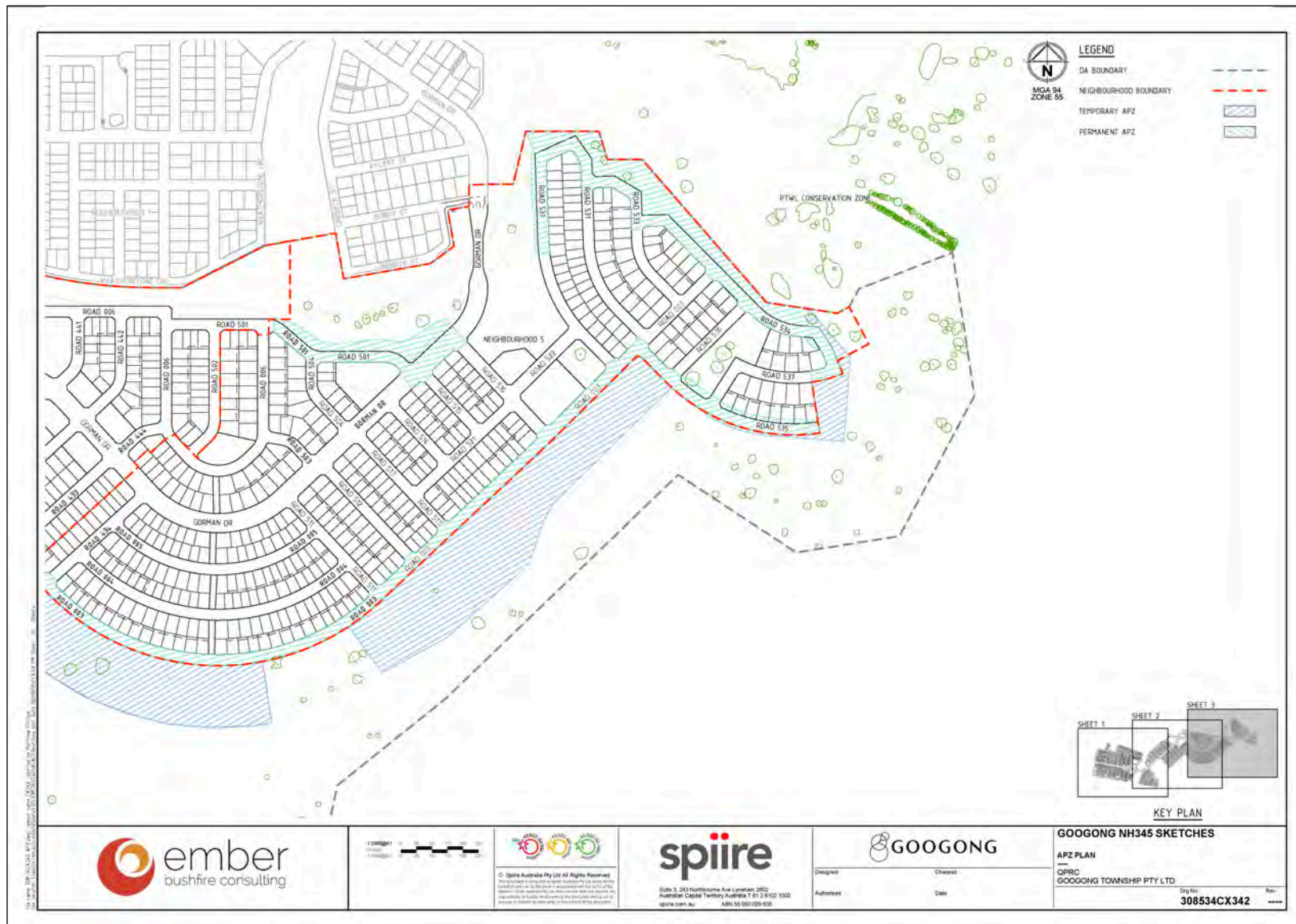


Figure 13 – APZ plan for NH 3. (Ember & Spiire, 2021)

## 2.8 BUSHFIRE ATTACK LEVEL ANALYSIS

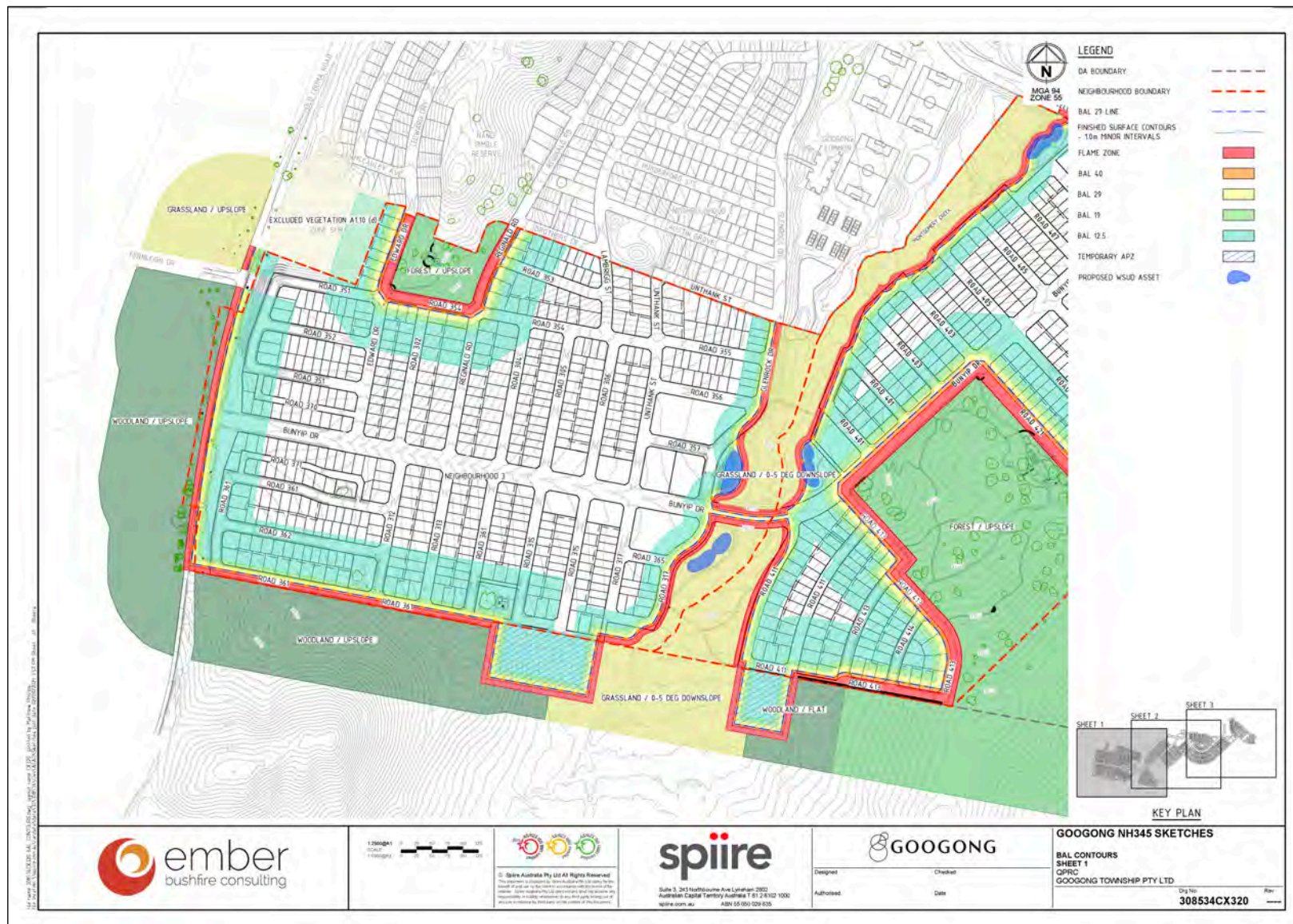


Figure 14 – NH 1 BAL analysis. (Ember & Spiire, 2021)



## BUSHFIRE ATTACK LEVEL ANALYSIS

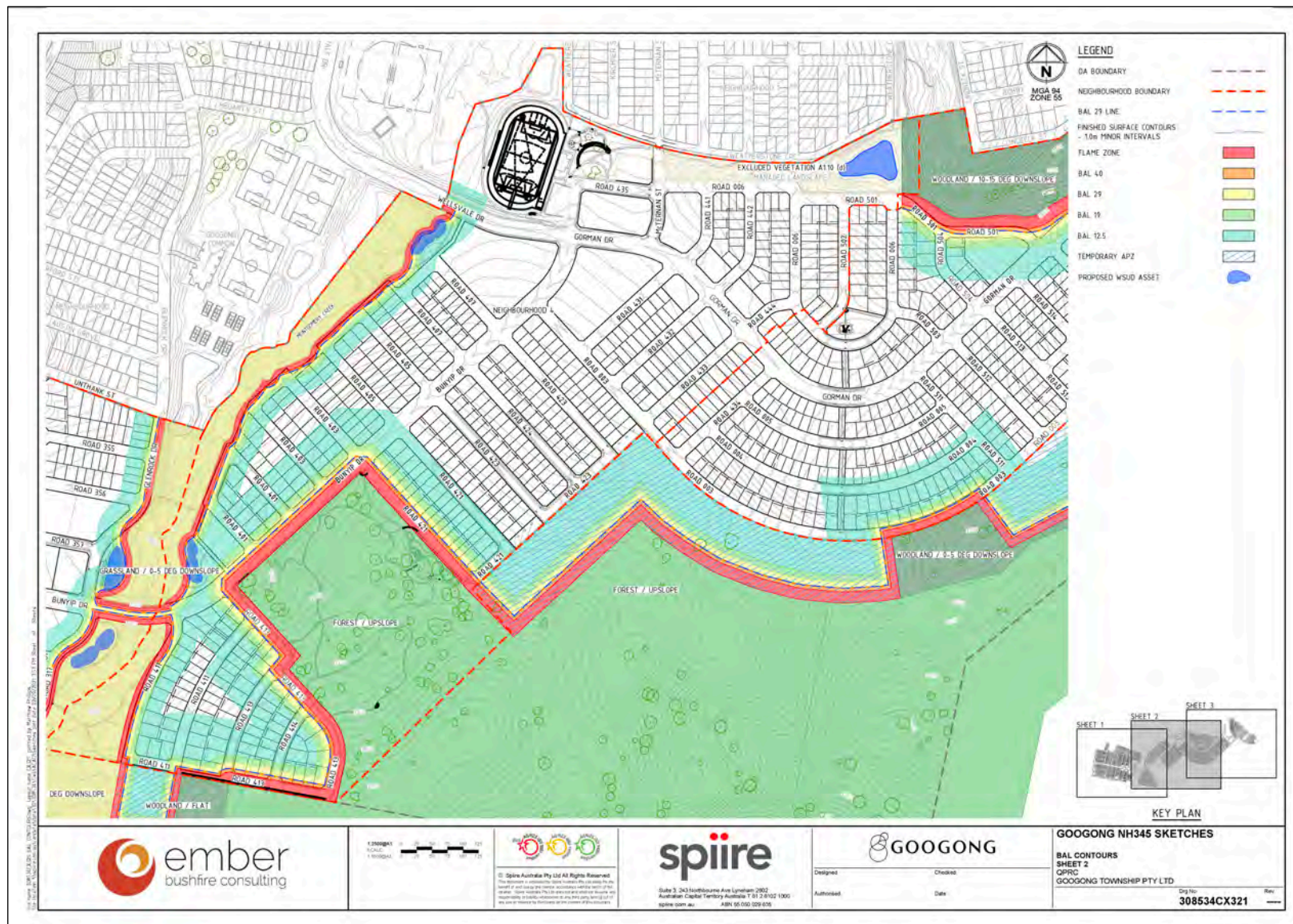


Figure 15 – NH 2 BAL analysis. (Ember & Spiire, 2021)



## BUSHFIRE ATTACK LEVEL ANALYSIS

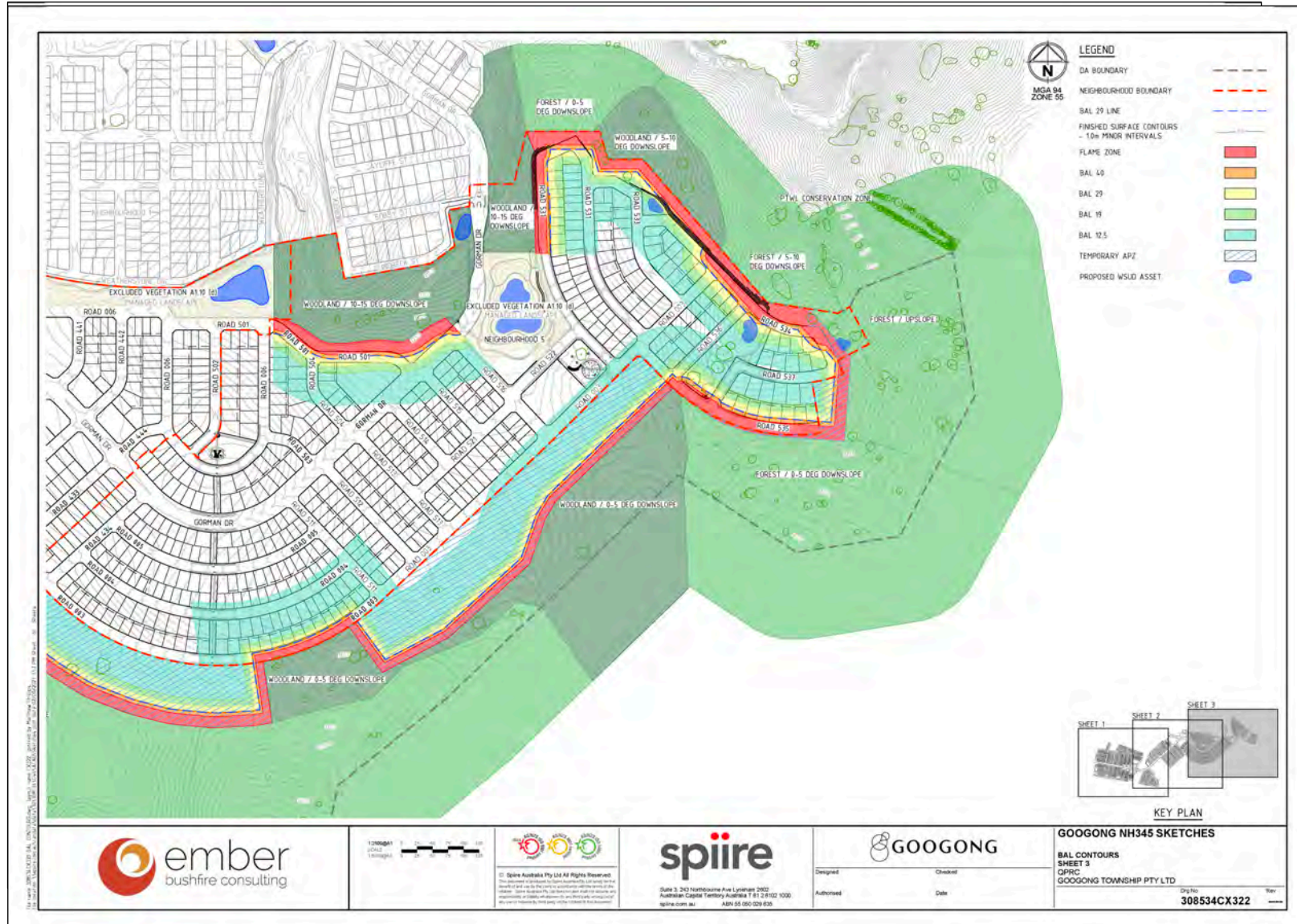


Figure 16 – NH 3 BAL analysis. (Ember & Spiire, 2021)



## 2.9 WATER SERVICES

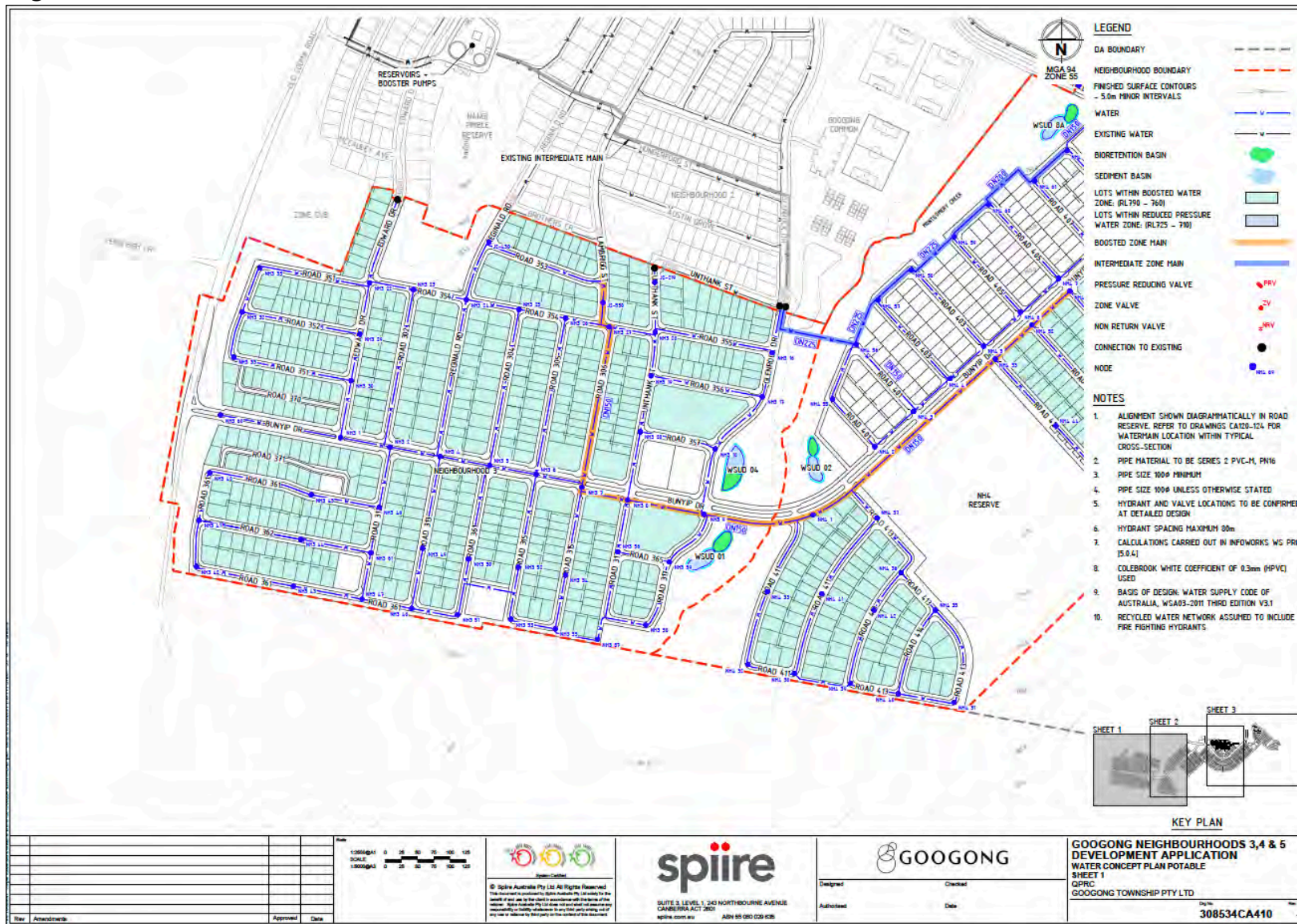


Figure 17 – NH 1 Water Concept Plan. (Ember & Spiire, 2021)



## WATER SERVICES

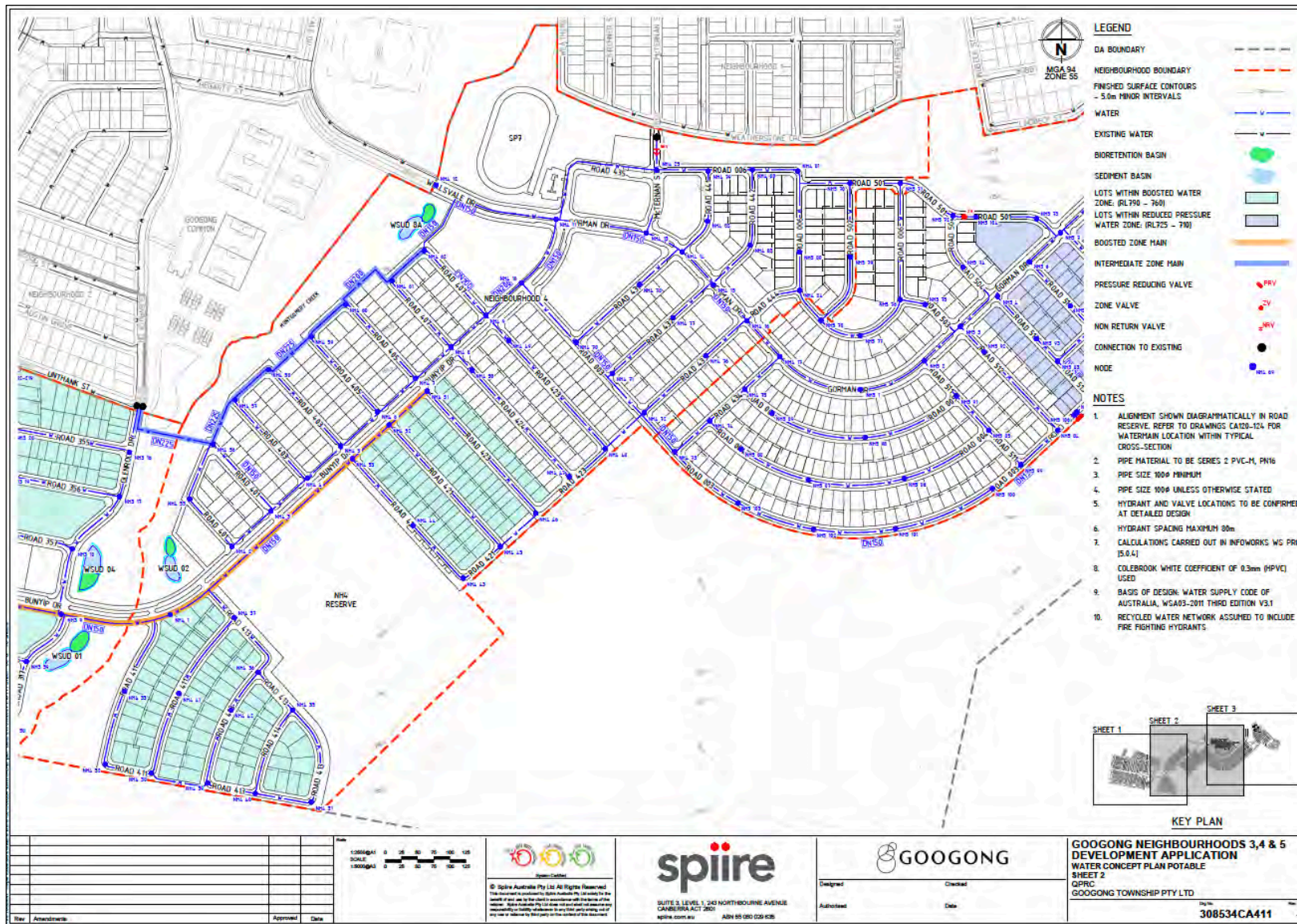


Figure 18 – NH 2 Water Concept Plan. (Ember & Spiire, 2021)



## WATER SERVICES

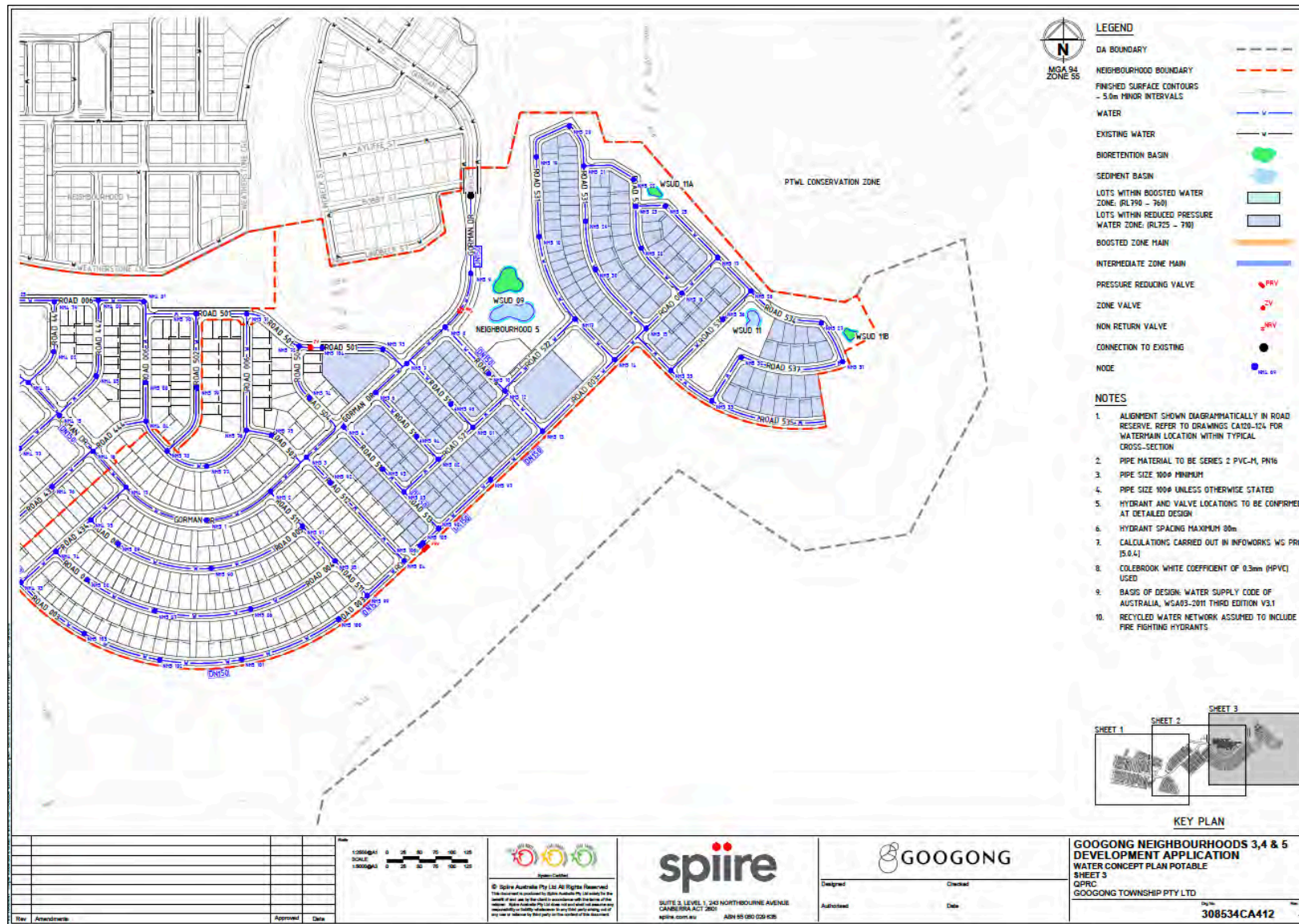


Figure 19 – NH 3 Water Concept Plan. (Ember & Spiire, 2021)



## 2.10 PHOTO POINT REFERENCE

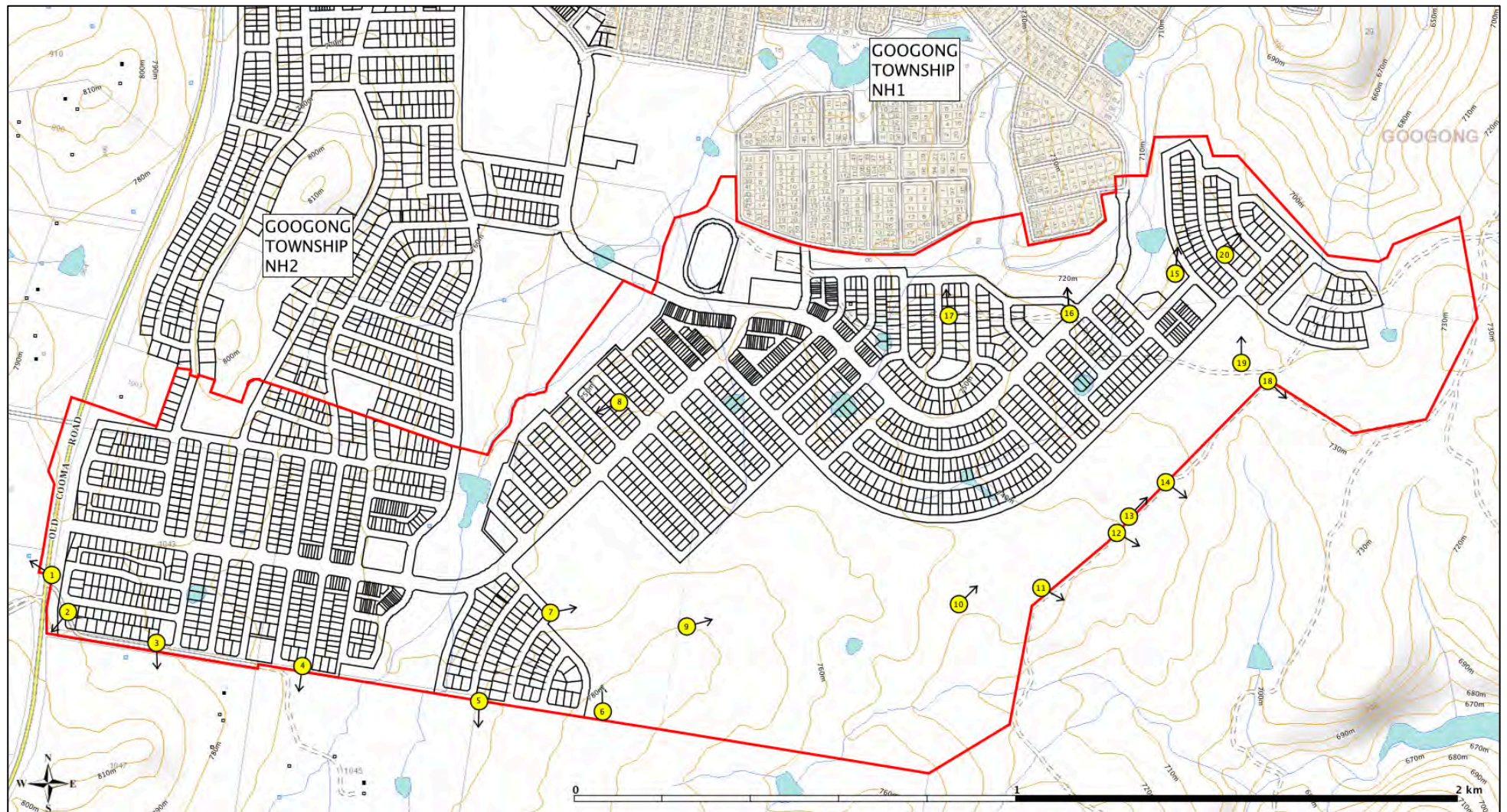


Figure 20 – Photo points reference (Dau, 2021)



## 2.11 SUBJECT SITE PHOTOGRAPHIC OVERVIEW

Photo 1.

Showing  
Woodland  
hazard West  
of Old Cooma  
Road.



Photo 2.

Showing  
Woodland  
hazard South  
of NH345.

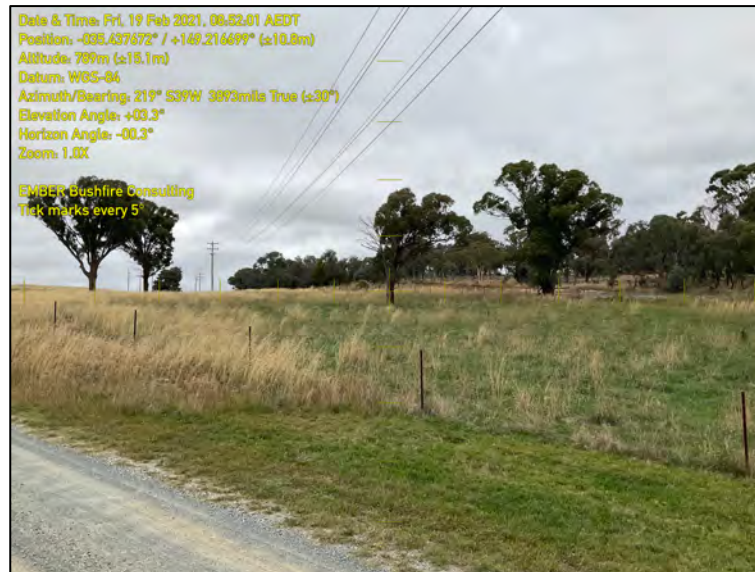


Photo 3.

Showing  
Woodland  
hazard South  
of NH345.

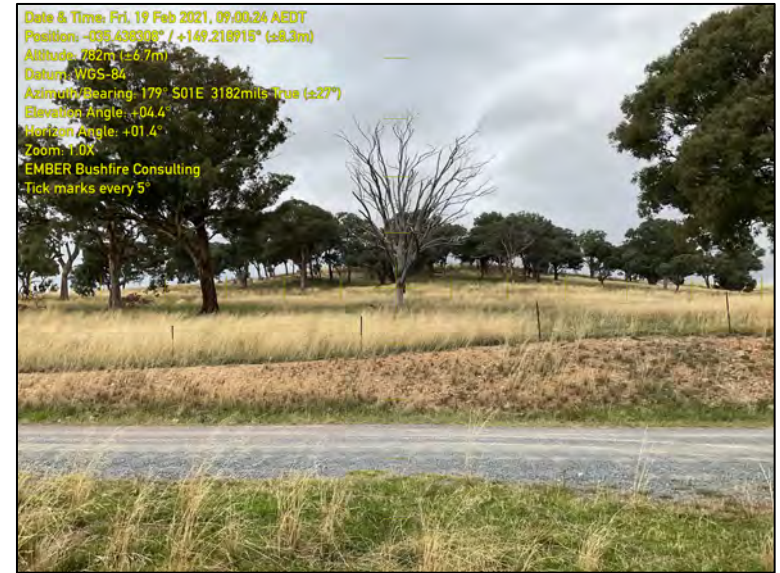


Photo 4.

Showing  
Grassland  
hazard South  
of the NH345

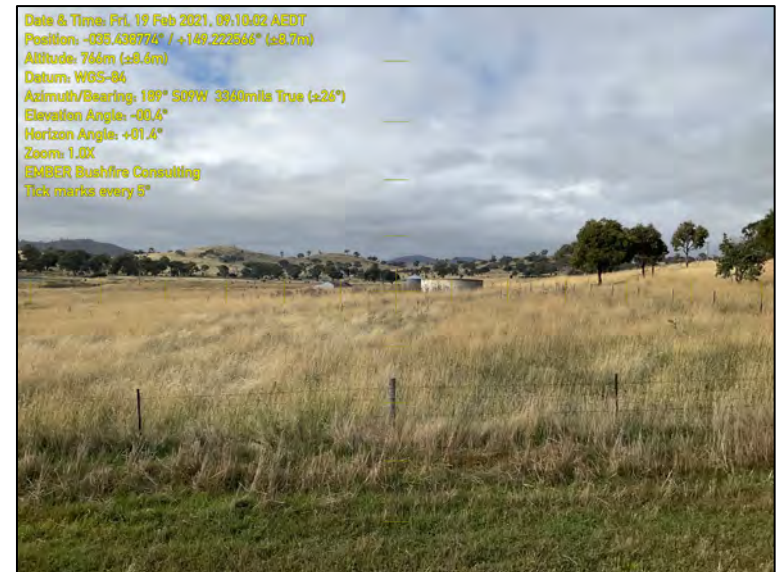




Photo 5.  
Showing  
current  
Grassland  
hazard South  
of NH345.  
Assessed as  
Woodland in  
line with PCT  
mapping

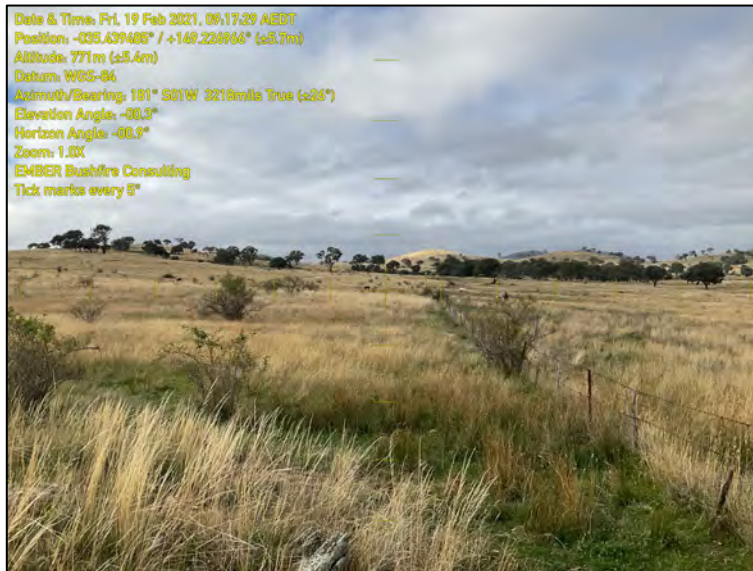


Photo 6.  
Showing  
current  
Woodland  
hazard within  
NH345, east  
of Road 413.  
Assessed as  
Forest in line  
with PCT  
mapping.

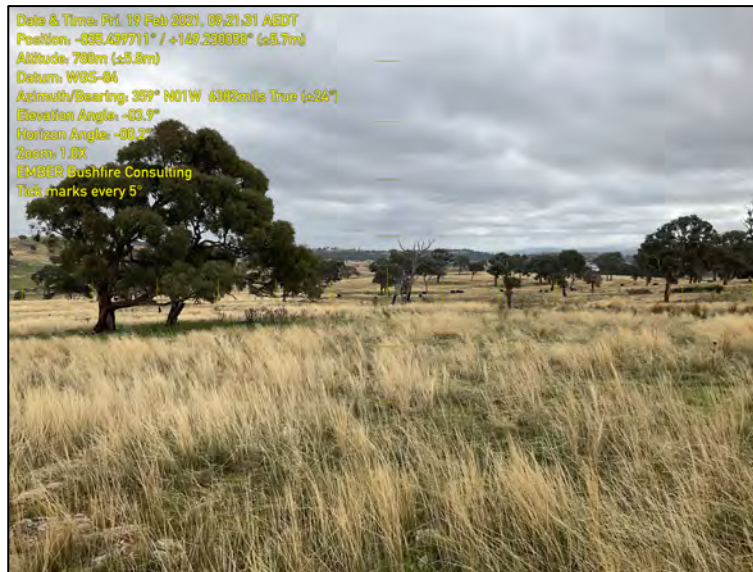


Photo 7. Aerial overview looking East from Road 413.



Photo 8. Aerial overview looking West, showing Nangi Pimple and Montgomery Ck.





Photo 9. Aerial overview looking East towards Googong Foreshore.



Photo 10. Aerial overview looking Northeast towards Googong Foreshore.



Photo 11.  
Looking East of  
NH345 outside  
of DA Extent  
towards  
Googong  
Foreshore.

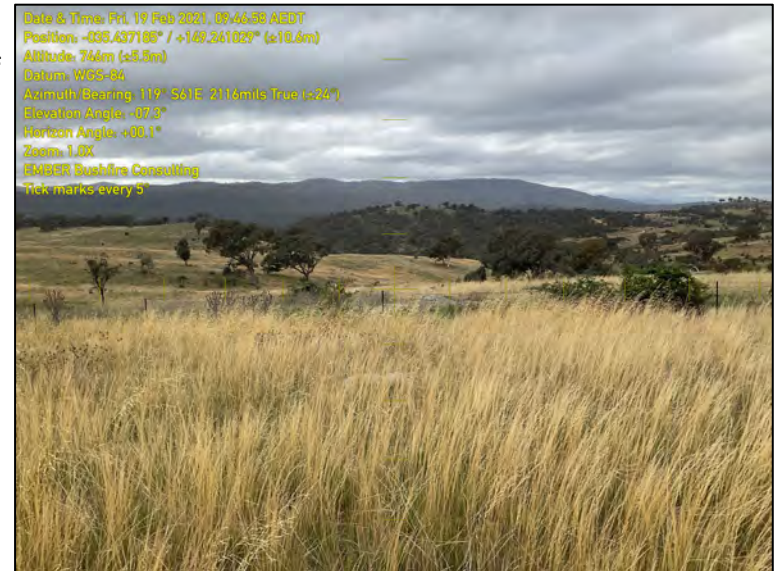


Photo 12.  
Looking East of  
NH345 outside  
of DA Extent  
towards  
Googong  
Foreshore.

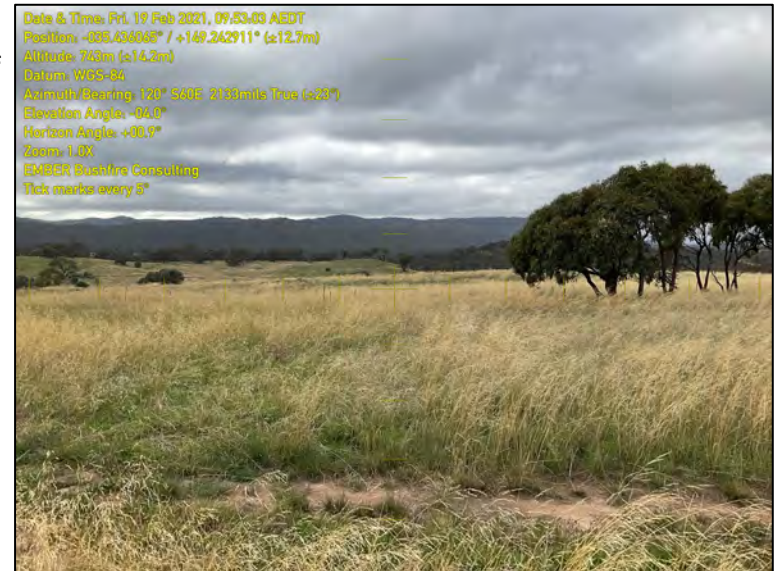




Photo 13. Looking Northeast of NH345 outside of DA Extent towards Googong Foreshore.



Photo 14.  
Looking East of  
NH345 outside  
of DA Extent  
towards  
Googong  
Foreshore.

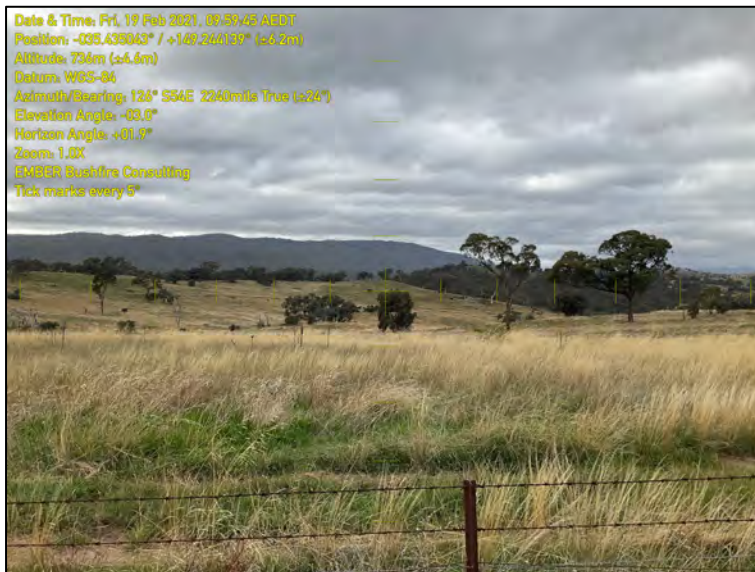


Photo 15.  
Looking North  
from within  
NH5 at current  
Woodland  
hazard. To be  
assessed as  
Forest in line  
with PCT  
Mapping.

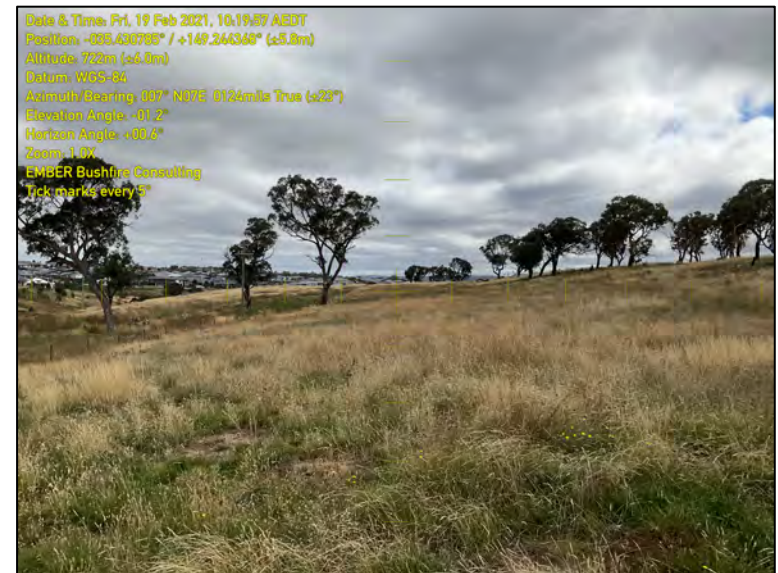


Photo 16.  
Looking North  
from within  
NH5 towards  
NH1.

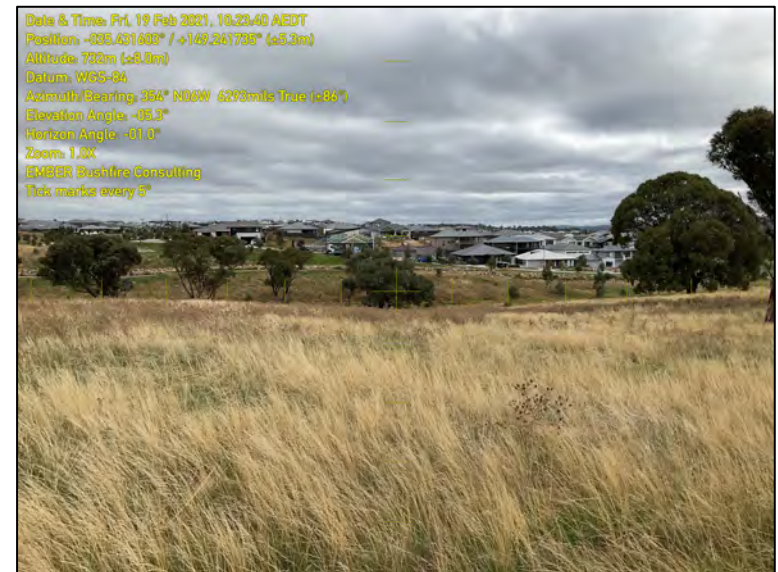




Photo 17.  
Looking North  
from within  
NH4 towards  
NH1.

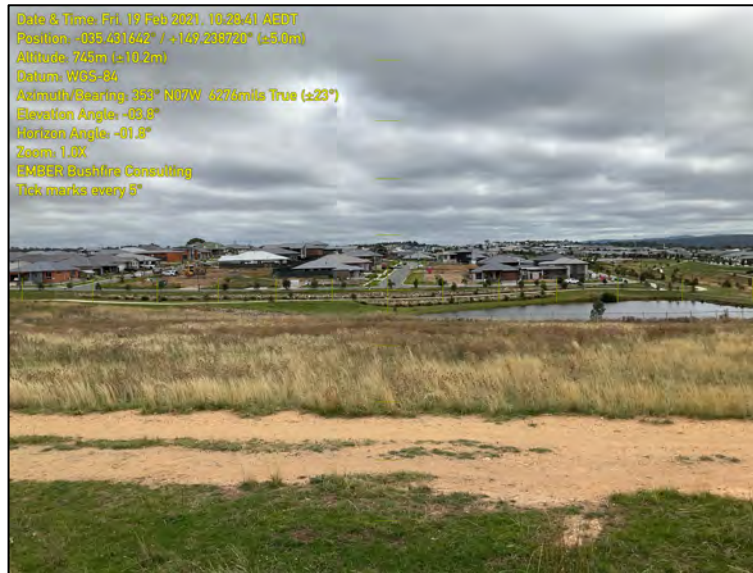


Photo 18.  
Looking East of  
NH345 outside  
of DA Extent  
towards  
Googong  
Foreshore.

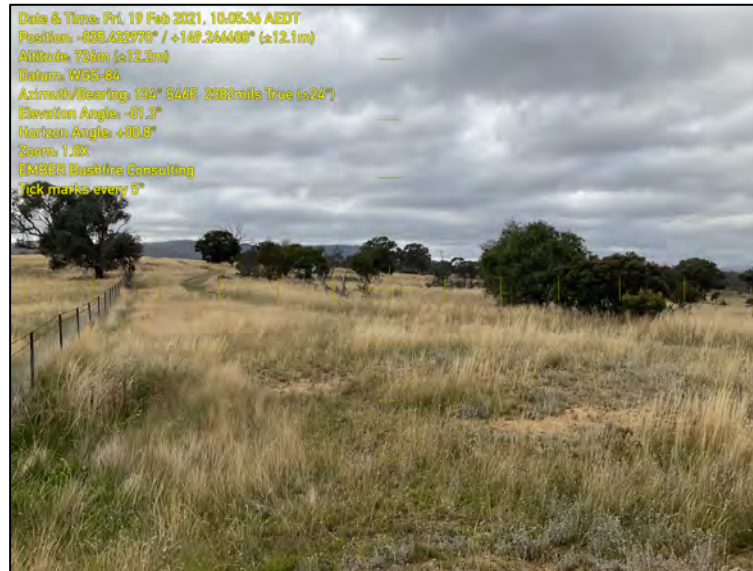
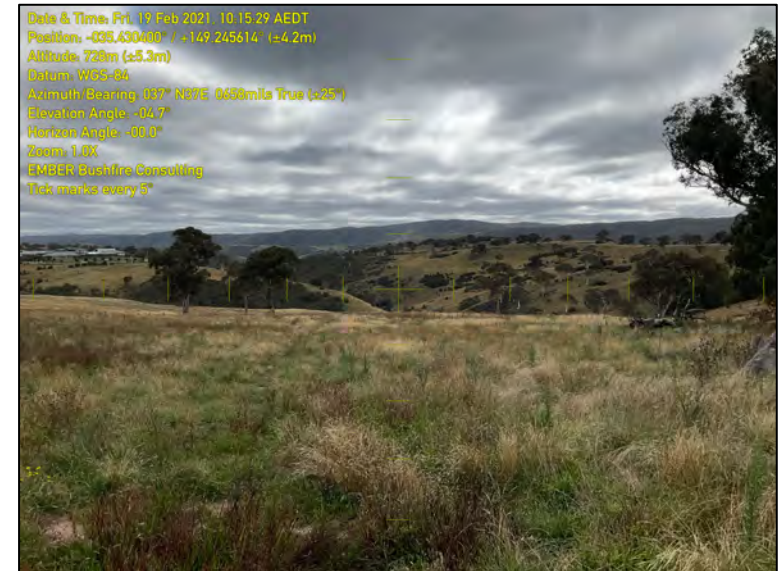


Photo 19.  
Showing  
aerial  
overview of  
future NH5.



Photo 20.  
Looking North  
from within  
NH5 towards  
PTWL  
conservation  
area.





### 3 BUSHFIRE PROTECTION MEASURES

In response to the bushfire threat analysis, a suite of Bushfire Protection Measures (BPMs) are required for the proposed subdivision in accordance with Section 5 of PBP 2019, Residential and Rural Residential Subdivisions.

A statement of compliance of the proposed subdivision against PBP 2019 is provided in Appendix A of this report.

#### 3.1 BPM DISCUSSION AND RECOMMENDATIONS:

##### 3.1.1 ASSET PROTECTION ZONES:

###### Discussion:

Appropriate APZ dimensions are determined through the analysis of slope and vegetation (Figure 5, 6, and 7) and crossed referenced to dimensions provided for residential subdivisions in Table A1.12.2 PBP 2019.

While vegetation across the site presents as open grassland, with scattered paddock trees and small pockets of remnant woodland, at the request of the developer a highly conservative approach has been taken for hazard analysis where the vegetation classification is aligned with Plant Community Type (PCT) Vegetation Zones identified in the biodiversity study (Figure 5). This takes into account in potential future vegetation state.

Terrain across the Googong development area is undulating, although further afield are deeper gullies associated with drainage lines into Googong

reservoir. These gullies feature some dense forest vegetation resulting in an increase in fuel load and potential threat in these areas.

Areas identified as open urban space have kept to less than 1 Ha in size so they can be classified as "Excluded Vegetation" in line with Appendix A1.10 of PBP 2019.

Areas of landscape that are subject to regular and ongoing maintenance are considered "managed land" and are classified as "Excluded Vegetation" (Fig 11 & 12) in line with Appendix A1.10 of PBP 2019.

An APZ Plan (Figures 8, 9 and 10) indicates areas declared APZs (both permanent and temporary), for the subdivision, taking into account external hazard vegetation, perimeter roads, road easements and verges and other landscaping opportunities to provide for the management of vegetation for the ongoing reduction of fuels opposite future residential development.

Temporary APZs (100 m in width) are provided in locations where further development is planned but not part of this current DA. These areas are identified as land subject to future LEP amendments shown in green areas in Figure 3.

BAL Analysis (Figures 11, 12 and 13) is provided to demonstrate that the subdivision as designed can achieve general compliance with Table A1.12.2 Minimum distances for APZs PBP 2019. A blue dashed line indicates the 29 kW/m<sup>2</sup> threshold boundary. Most residential lots fall within this threshold.

For Nangi Pimple only, the BAL Analysis incorporates a performance-based solution using Method 2 of AS 3959-2018 (Standards Australia 2018) to assess whether the radiant heat exposure achieved meets the residential development threshold of 29 kW/m<sup>2</sup>.

This performance-based solution incorporates site specific inputs including the effective slope of 4 degrees upslope (Attachment C) to model the upsloping landscape opposite residential lots in this area, which would result in a “backing fire” and a reduction radiant heat.

Where the 29 kW/m<sup>2</sup> threshold boundary encroaches into a residential lot (shown in the detailed BAL Analysis Attachment D) mandatory setbacks or restriction in use will be placed on each lot for the setback shown to ensure any development is behind the 29 kW/m<sup>2</sup> threshold boundary.

Recommendations:

- APZs be incorporated into the subdivision in accordance with the APZ Plan (Figures 8, 9 and 10) to ensure a future dwelling can achieve BAL-29 and therefore comply with the requirements of Table A1.12.2 PBP 2019.
- Where the 29 kW/m<sup>2</sup> threshold encroaches into a residential lot, mandatory setbacks are to be placed on any future residence to ensure any the residence is behind the 29 kW/m<sup>2</sup> threshold boundary.

A statement of compliance of the proposed subdivision against PBP 2019 is provided in Appendix A of this report.

APZs provided across the proposed subdivision are deemed capable of meeting the minimum dimensions necessary to establish APZs with the site and therefore will meet the acceptable solutions provided by PBP 2019.

3.1.2 LANDSCAPING:

Recommendations:

- All landscape within the areas identified as APZ (Figure 11, 12 and 13) would require management in perpetuity and in accordance with the requirements of Asset Protection Zone Standards - Appendix 4 of PBP (2019) (Attachment B).

3.1.3 ACCESS:

Discussion:

Access to and from the subject site is via a single access point to Old Cooma Road (a public through road) to the west and 6 points through to the existing road network at Googong Neighbourhoods 1 and 2 to the north.

The proposal is designed with an interconnected road network including perimeter roads and multiple connection points with Googong Neighbourhoods 1 and 2 enabling through road access for the estate (Figure 6, 7 & 8).



Two access gates will be provided to the Googong Foreshore Reserve which will provide connection to an existing fire trail which runs north to south in the Reverse. This trail is outside the subject site. These gates will allow access for ACT Emergency Service Agency Firefighters for hazard reduction and firefighting activities.

Fire trails are not required under Planning for Bushfire Protection (2019) and therefore not proposed. There are no registered fire trails running from or through the subject site that require preservation.

A statement of compliance of the proposed subdivision against PBP 2019 is provided in Appendix A of this report.

Recommendations:

- As a minimum, all road and access specifications and dimensions to comply with those detailed in PBP 2019 as provided here in Attachment A.

**3.1.4 SERVICES – WATER, ELECTRICITY AND GAS:**

Recommendations:

- Water Supplies - Future residences are to be provided with the water supplies which comply with the specifications set out in PBP (2019) which are provided in Appendix A of this report.

- Electricity Services – Electricity supply throughout subject site is to be provided in compliance with the specifications set out in PBP (2019) which are provided in Appendix A of this report.
- Gas Services – It is envisaged that gas supplies to any future residence will be by gas pipeline and therefore supplies and fittings are to comply with specifications set out in PBP (2019) which are provided in Appendix A of this report.

**3.1.5 CONSTRUCTION REQUIREMENTS AND OTHER PROTECTION MEASURES**

Discussion:

The minimum APZ dimensions for residences opposite areas identified as hazard are provided to ensure that any future dwelling is capable of achieving BAL-29 and therefore compliance with Table A1.12.2 of PBP 2019.

Sprinkler systems or any other additional protections measures are not proposed as part of this development proposal.

Recommendations:

- A subsequent BAL assessment should be carried out prior to the construction of any future dwelling to assess the BAL rating as it is dependent on the specific location of that dwelling.

- Future construction must comply with the relevant sections of Australian Standard AS3959-2018 Amd 2 Construction of buildings in bush fire-prone areas as amended, or
- NASH Standard (1.7.14 updated) National Standard Steel Framed Construction in Bushfire Areas – 2014 as appropriate, and
- Section 7.5 of Planning for Bush Fire Protection 2019.

### 3.2 BUSHFIRE PROTECTION MEASURES CONCLUSION

The proposed subdivision has been assessed and found capable of the following:

- APZs can provide sufficient space and reduced fuel loads to ensure radiant heat levels at the building will not exceed 29 kW/m<sup>2</sup>.
- Landscaping can be managed to minimise flame contact, reduce radiant heat levels, minimise embers and reduce the effect of smoke on residents and firefighters.
- With the aid of performance-based design, safe operational access can be provided to structures and water supplies for emergency services, while providing for evacuating residents and suitable access is provided for fire management and APZ management purposes.
- Providing water for the protection of buildings during and after the passage of a bush fire, gas and electricity will be located so as not to contribute to the risk of fire to a building.

## 4 ENVIRONMENTAL CONSIDERATIONS

Information regarding the potential impact that the proposed development may have on environmental and cultural values of the site are required as part of the issuing of the bush fire safety authority by the NSWRFSS.

EMBER Bushfire Consulting understands from the proponent that any necessary environmental and cultural investigations are being undertaken as part of the development application process and will be submitted as part of the Statement of Environmental Effects.

Furthermore, if any environmental or culturally sensitive areas of the lot are impacted by the recommended protection measures, consultation will be made to provide alternative protection measures.

At the time of this bushfire assessment no known environmental or cultural values or significant environmental features have been identified on the subject site.



## 5 CONCLUSION

This report documents the findings from a bush fire assessment of the Development Application of the multi lot residential subdivision of Googong Neighbourhoods 3, 4, 5.

This report establishes the level of bushfire threat to the subdivision and examines bushfire protection for measures such as asset protection, access and services.

While vegetation across the site presents as open grassland, with scattered paddock trees and small pockets of remnant woodland, a highly conservative approach has been taken for hazard analysis where the vegetation classification is aligned with Plant Community Type Vegetation Zones identified in the biodiversity study. This takes into account in potential future hazard vegetation state.

This threat can be moderated given the standard suite of protection measures offered by PBP 2019 and for which the proposed development can largely comply.

The future development provides good space for the establishment and maintenance of the required APZs.

Planned access throughout the subdivision is well provided for and given that future roads will apply the standards and specifications set out with PBP (2019) will comply with the acceptable solutions provided.

Planned services throughout the subdivision are to meet the standards and specifications set out with PBP (2019) and will be capable of complying with the acceptable solutions.

Based on the assessment and the recommendations contained in this report the proposed development is deemed capable of complying with the specific and broad objectives of PBP (2019), the requirements of the Rural Fire regulations (2013) and therefore suitable for submission to the NSWRFs for the issuing of a bush fire safety authority.

## 6 REFERENCE

Australian Building Codes Board (ABCB), 2019, *National Construction Code - Building Code of Australia Volume 1 & 2*, Canberra

ePlanning Spatial Viewer, Department of Planning Industry and Environment, accessed 12 June 2021,  
<https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address>

Keith D, 2004, *Ocean Shores to Desert Dunes: the native vegetation of NSW and the ACT*, Dept of Environment and Conservation, NSW Government.

NSW Rural Fire Service, 2005, *Standards for Asset Protection Zones*. Sydney

NSW Rural Fire Service, 2019, *Planning for Bushfire Protection*. Sydney

Standards Australia, 2018, AS 3959-2018 *Construction of buildings in Bushfire Prone Areas* SAI Global, Melbourne.



# ATTACHMENT A – PBP 2019 COMPLIANCE ASSESSMENT

The following compliance assessment tables the performance criteria to be met under each protection measure for the proposed development. The table also identifies which avenue is used to achieve compliance, details of the acceptable solution and specific information on the how this is achieved for the proposed development.

Performance Criteria	Method of Compliance	Acceptable Solution	Comments / Details
<b>ASSET PROTECTION ZONES</b>			
<ul style="list-style-type: none"> <li>Potential building footprints must not be exposed to radiant heat levels exceeding 29 kW/m<sup>2</sup> on each proposed lot.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>APZs are provided in accordance with Tables A1.12.2 and A1.12.3 based on the FFDI.</li> </ul>	APZ dimensions will be compliant with Table A1.12.2.
<ul style="list-style-type: none"> <li>APZs are managed and maintained to prevent the spread of a fire towards the building.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>APZs are managed in accordance with the requirements of Appendix 4.</li> </ul>	Landscaping within the APZ will be required to be in accordance with the principles provided in Appendix 4 – Asset Protection Zone Standards, PBP 2019 which is provided in Attachment B of this report.
<ul style="list-style-type: none"> <li>The APZs is provided in perpetuity.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>APZs are wholly within the boundaries of the development site</li> </ul>	All APZs are within the boundaries of the development site.
<ul style="list-style-type: none"> <li>APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>APZs are located on lands with a slope less than 18 degrees.</li> </ul>	All APZs are located on land with slope less than 18 degrees.
<b>LANDSCAPING</b>			
<ul style="list-style-type: none"> <li>Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>landscaping is in accordance with Appendix 4; and</li> <li>fencing is constructed in accordance with section 7.6.</li> </ul>	Landscaping within the APZ will be required to be in accordance with the principles provided in Appendix 4 – Asset Protection Zone Standards, PBP 2019 which is provided in Attachment B of this report.
<b>ACCESS (General Requirements)</b>			

Performance Criteria	Method of Compliance	Acceptable Solution	Comments / Details
<ul style="list-style-type: none"> <li>firefighting vehicles are provided with safe, all-weather access to structures.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>property access roads are two-wheel drive, all-weather roads;</li> <li>perimeter roads are provided for residential subdivisions of three or more allotments;</li> <li>subdivisions of three or more allotments have more than one access in and out of the development;</li> <li>traffic management devices are constructed to not prohibit access by emergency services vehicles;</li> <li>maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient;</li> <li>all roads are through roads;</li> <li>dead end roads are not recommended, but if unavoidable, are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end;</li> <li>where kerb and guttering is provided on perimeter roads, roll top kerbing should be used to the hazard side of the road;</li> <li>where access/egress can only be achieved through forest, woodland and heath vegetation, secondary access shall be provided to an alternate point on the existing public road system; and</li> <li>one way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression.</li> </ul>	The access provisions are capable of complying with all the acceptable solutions provided for access in PBP 2019.
<ul style="list-style-type: none"> <li>the capacity of access roads is adequate for firefighting vehicles.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>the capacity of perimeter and non-perimeter road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges / causeways are to clearly indicate load rating.</li> </ul>	The capacity of bridges/causeways will be sufficient to carry fully loaded firefighting vehicles; bridges / causeways will clearly indicate load rating.
<ul style="list-style-type: none"> <li>there is appropriate access to water supply.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression;</li> <li>hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005 - Fire hydrant installations System design, installation and commissioning; and</li> <li>there is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.</li> </ul>	It is assumed that a reticulated water supply system to the appropriate standard will be provided for the subdivision as planned.
PERIMETER ROADS			



Performance Criteria	Method of Compliance	Acceptable Solution	Comments / Details
<ul style="list-style-type: none"> <li>access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.</li> </ul>	Perimeter roads are not applicable..	<ul style="list-style-type: none"> <li>are two-way sealed roads;</li> <li>minimum 8m carriageway width kerb to kerb;</li> <li>parking is provided outside of the carriageway width;</li> <li>hydrants are located clear of parking areas;</li> <li>are through roads, and these are linked to the internal road system at an interval of no greater than 500m;</li> <li>curves of roads have a minimum inner radius of 6m; the maximum grade road is 15 degrees and average grade of not more than 10 degrees;</li> <li>the road crossfall does not exceed 3 degrees; and</li> <li>a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.</li> </ul>	Perimeter roads will be provided in line with the acceptable solutions as detailed in the adjacent cell.
<b>NON-PERIMETER ROADS</b>			
<ul style="list-style-type: none"> <li>access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating.</li> </ul>	Non-Perimeter roads are not applicable.	<ul style="list-style-type: none"> <li>minimum 5.5m carriageway width kerb to kerb;</li> <li>parking is provided outside of the carriageway width;</li> <li>hydrants are located clear of parking areas;</li> <li>roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m;</li> <li>curves of roads have a minimum inner radius of 6m;</li> <li>the road crossfall does not exceed 3 degrees; and</li> <li>a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.</li> </ul>	Non-Perimeter roads will be provided in line with the acceptable solutions as detailed in the adjacent cell.
<b>PROPERTY ACCESS</b>			
<ul style="list-style-type: none"> <li>firefighting vehicles can access the dwelling and exit the property safely.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>There are no specific access requirements in an urban area where an unobstructed path (no greater than 70m) is provided between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles.</li> <li>In circumstances where this cannot occur, the following requirements apply: <ul style="list-style-type: none"> <li>minimum 4m carriageway width;</li> <li>in forest, woodland and heath situations, rural property access roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m at the passing bay;</li> <li>a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches;</li> <li>provide a suitable turning area in accordance with Appendix 3;</li> </ul> </li> </ul>	The property access provisions will comply with those required under PBP 2019 as detailed in the adjacent cell.

Performance Criteria	Method of Compliance	Acceptable Solution	Comments / Details
		<ul style="list-style-type: none"> <li>curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress;</li> <li>the minimum distance between inner and outer curves is 6m;</li> <li>the crossfall is not more than 10 degrees;</li> <li>maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads; and</li> <li>a development comprising more than three dwellings has access by dedication of a road and not by right of way.</li> </ul> <p>Note: Some short constrictions in the access may be accepted where they are not less than 3.5m wide, extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above.</p>	
<b>WATER SUPPLIES</b>			
<ul style="list-style-type: none"> <li>adequate water supplies is provided for firefighting purposes.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>reticulated water is to be provided to the development where available;</li> <li>a static water and hydrant supply is provided for non-reticulated developments or where reticulated water supply cannot be guaranteed; and</li> <li>static water supplies shall comply with Table 5.3d.</li> </ul>	It is assumed that a reticulated water supply system to the appropriate standard will be provided for the subdivision.
<ul style="list-style-type: none"> <li>water supplies are located at regular intervals; and</li> <li>the water supply is accessible and reliable for firefighting operations.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard AS 2419.1:2005;</li> <li>hydrants are not located within any road carriageway; and</li> <li>reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.</li> </ul>	It is assumed that a reticulated water supply system to the appropriate standard will be provided for the subdivision.
<ul style="list-style-type: none"> <li>flows and pressure are appropriate.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.</li> </ul>	It is assumed that a reticulated water supply system to the appropriate standard will be provided for the subdivision.
<ul style="list-style-type: none"> <li>the integrity of the water supply is maintained.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>all above-ground water service pipes are metal, including and up to any taps; and</li> <li>above-ground water storage tanks shall be of concrete or metal.</li> </ul>	Where provided all above-ground water service pipes will be metal and above-ground water storage tanks shall be of concrete or metal.
<b>ELECTRICITY SERVICES</b>			
<ul style="list-style-type: none"> <li>location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>where practicable, electrical transmission lines are underground;</li> <li>where overhead, electrical transmission lines are proposed as follows: <ul style="list-style-type: none"> <li>lines are installed with short pole spacing of 30m, unless crossing gullies, gorges or riparian areas; and</li> </ul> </li> </ul>	Future electricity supplies will be capable of meeting these requirements.



Performance Criteria	Method of Compliance	Acceptable Solution	Comments / Details
		<ul style="list-style-type: none"> <li>no part of a tree is closer to a power line than the distance set out in ISSC3 Guideline for Managing Vegetation Near Power Lines.</li> </ul>	
<b>GAS SERVICES</b>			
<ul style="list-style-type: none"> <li>location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.</li> </ul>	Will meet the acceptable solutions.	<ul style="list-style-type: none"> <li>reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 - The storage and handling of LP Gas, the requirements of relevant authorities, and metal piping is used;</li> <li>all fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side;</li> <li>connections to and from gas cylinders are metal;</li> <li>polymer-sheathed flexible gas supply lines are not used; and</li> <li>above-ground gas service pipes are metal, including and up to any outlets.</li> </ul>	Future gas supplies will be capable of meeting these requirements.

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# ATTACHMENT B – APZs, LANDSCAPING, FENCES AND GATES

In Australia, bush fires are a natural and essential aspect of the landscape as many plants and animals have adapted to fire as part of their life cycle. However, development adjacent to bush land areas has increased the risk of fire impacting on people and their assets. The impact on property and life can be reduced with responsible preparation and management of bush fire hazards.

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

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

## A4.1 Asset protection zones

An APZ is a fuel-reduced area surrounding a built asset or structure.

For a complete guide to APZs and landscaping, download the NSW RFS document *Standards for Asset Protection Zones* at: [www.rfs.nsw.gov.au/resources/publications](http://www.rfs.nsw.gov.au/resources/publications).

An APZ provides:

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

Potential bush fire fuels should be minimised within an APZ. This is so that the vegetation within the planned zone does not provide a path for the transfer of fire to the asset either from the ground level or through the tree canopy.

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

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

The APZ should be located between an asset and the bush fire hazard.

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

In forest vegetation, the APZ can be made up of an inner protection area (IPA) and an outer protection area (OPA).

## Inner protection areas (IPAs)

The IPA is the area closest to the asset and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the development and be a defensible space. Vegetation within the IPA should be kept to a minimum level. Litter fuels within the IPA should be kept below 1cm in height and be discontinuous.

In practical terms the IPA is typically the curtilage around the dwelling, consisting of a mown lawn and well maintained gardens.

When establishing and maintaining an IPA the following requirements apply:

### Trees:

- canopy cover should be less than 15% (at maturity)
- trees (at maturity) should not touch or overhang the building
- lower limbs should be removed up to a height of 2m above ground
- canopies should be separated by 2 to 5m
- preference should be given to smooth barked and evergreen trees.

### Shrubs:

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

### Grass:

- should be kept mown (as a guide grass should be kept to no more than 100mm in height)
- leaves and vegetation debris should be removed.

## Outer protection areas (OPAs)

An OPA is located between the IPA and the unmanaged vegetation. Vegetation within the OPA can be managed to a more moderate level. The reduction of fuel in this area substantially decreases the intensity of an approaching fire and restricts the pathways to crown fuels; reducing the level of direct flame, radiant heat and ember attack on the IPA.

Because of the nature of an OPA, they are only applicable in forest vegetation.

In practical terms the OPA is an area where there is maintenance of the understorey and some separation in the canopy.

When establishing and maintaining an OPA the following requirements apply:

### Trees:

- tree canopy cover should be less than 30%
- trees should have canopy separation
- canopies should be separated by 2 to 5m

### Shrubs:

- shrubs should not form a continuous canopy
- shrubs should form no more than 20% of ground cover

### Grass:

- should be kept mown (as a guide grass should be kept to no more than 100mm in height)
- leaf and other debris should be mown, slashed or mulched.

An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bush fires. Maintenance of the IPA and OPA to the standards given above should be undertaken on an annual basis, in advance of the fire season, as a minimum.

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## **FENCES & GATES (SECTION 7.6 PBP 2019)**

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

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

## ATTACHMENT C – FIRE MODELLING

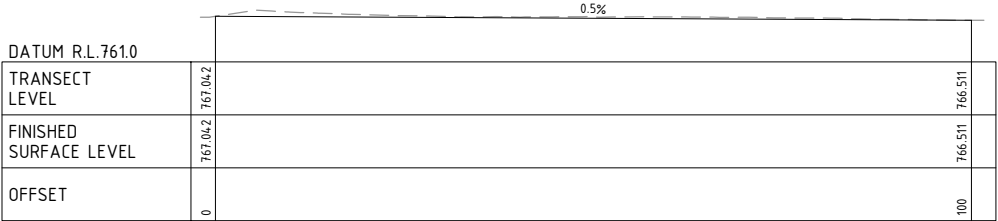
 <p>Calculated September 3, 2021, 9:45 pm (MDc v.4.9)</p> <p><b>Googong NH 1 Nangi Pimple</b></p> <p><b>Minimum Distance Calculator - AS3959-2018 (Method 2)</b></p>			
Inputs		Outputs	
Fire Danger Index	100	Rate of spread	2.27 km/h
Vegetation classification	Forest	Flame length	18.99 m
Understorey fuel load	25 t/ha	Flame angle	52 °, 62 °, 69 °, 73 °, 75 ° & 81 °
Total fuel load	35 t/ha	Elevation of receiver	7.48 m, 8.380000000000001 m, 8.859999999999999 m, 9.08 m, 9.17 m & 9.380000000000001 m
Vegetation height	n/a	Fire intensity	41,165 kW/m
Effective slope	-4 °	Transmissivity	0.864, 0.842, 0.8139999999999999, 0.788, 0.775 & 0.718
Site slope	0 °	Viewfactor	0.6065, 0.4522, 0.3065, 0.2082, 0.1692 & 0.0457
Flame width	100 m	Minimum distance to < 40 kW/m <sup>2</sup>	15.5 m
Windspeed	n/a	Minimum distance to < 29 kW/m <sup>2</sup>	20.7 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m <sup>2</sup>	29.5 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m <sup>2</sup>	40.6 m
		Minimum distance to < 10 kW/m <sup>2</sup>	47.5 m

Rate of Spread - McArthur, 1973 & Noble et al., 1980  
 Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980  
 Elevation of receiver - Douglas & Tari, 2005  
 Flame angle - Douglas & Tari, 2005  
 Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tari, 2005

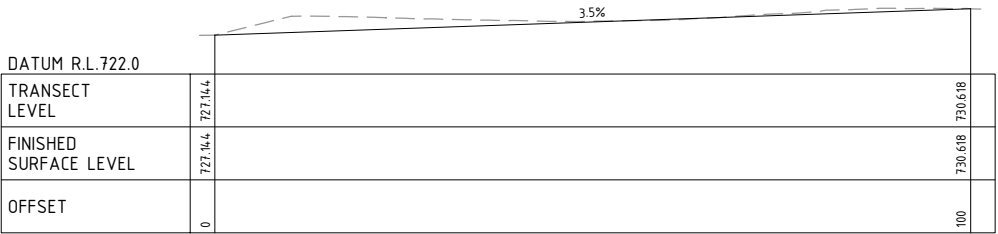
## ATTACHMENT D - SUPPORTING INFORMATION



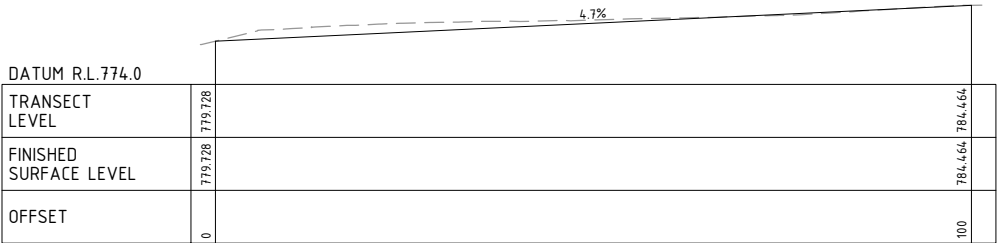
file name 308534CX325 BUSHFIRE SLOPE PLAN.dwg layout name CX327 plotted by Matthew Phillips  
file location \\spiire.com.au\data\308534\Civil\ACAD\Sketches plot date 02/09/2021 4:01 PM Sheet 3 of 3



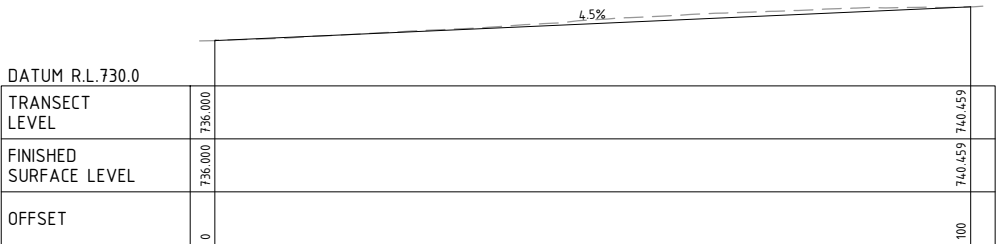
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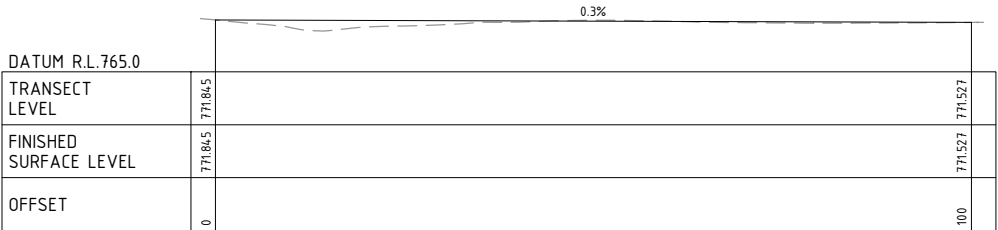
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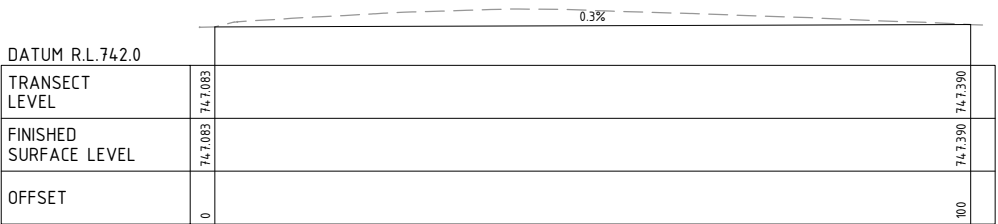
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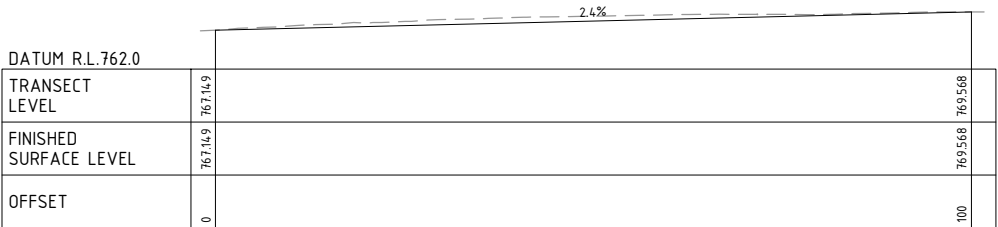
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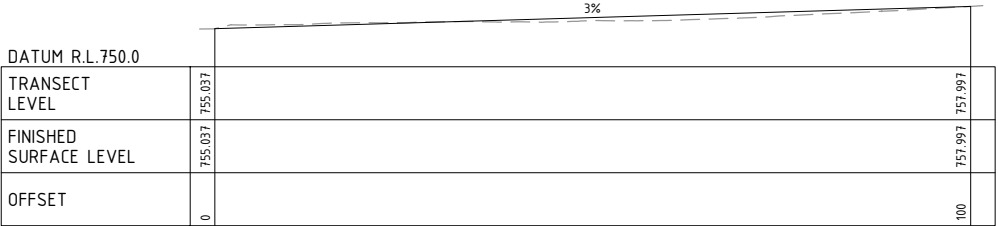
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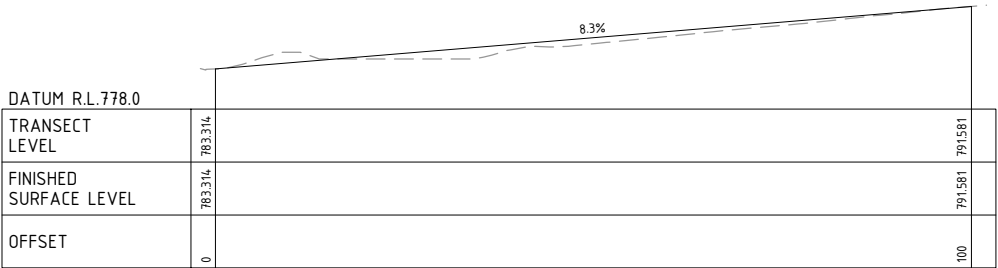
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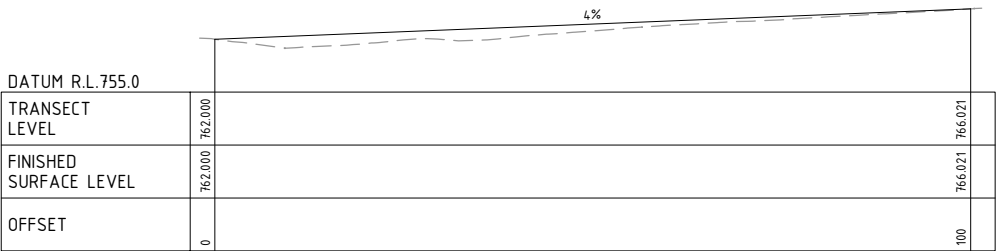
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TRANSECT - 07



TRANSECT - 01



TRANSECT - 06



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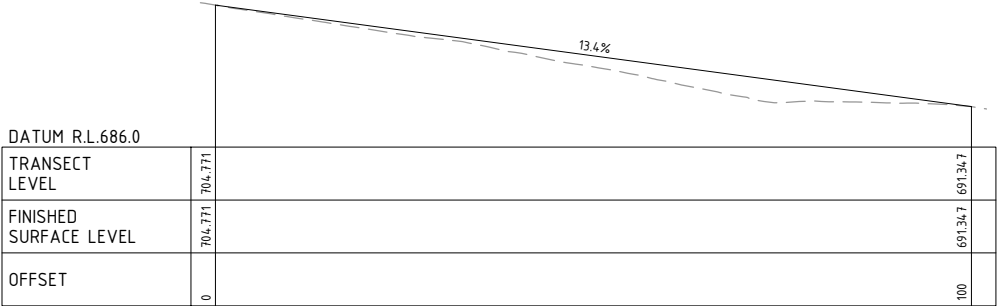
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Authorised	Date

GOOGONG NH345 SKETCHES

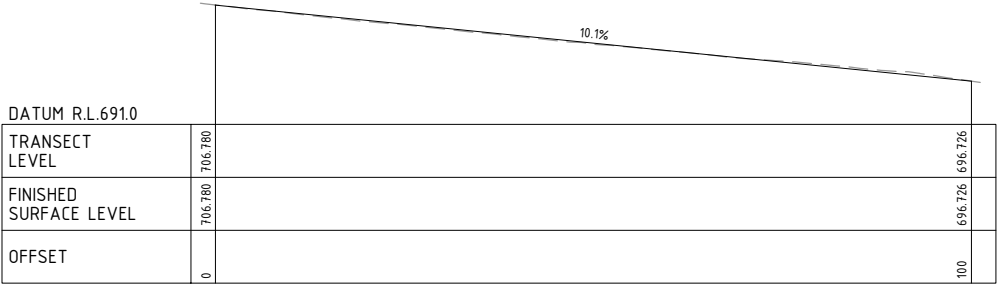
BUSHFIRE SLOPE PLAN  
SHEET 3  
QPRC  
GOOGONG TOWNSHIP PTY LTD

Drg No	Rev
308534CX327	----

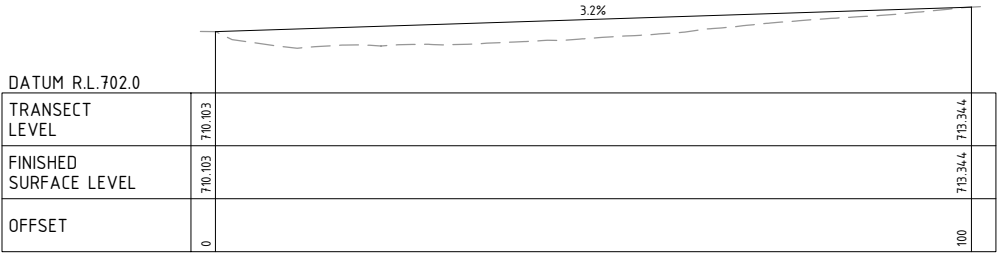
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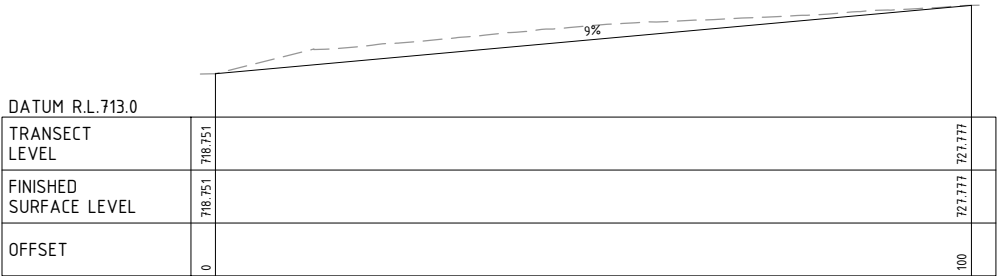
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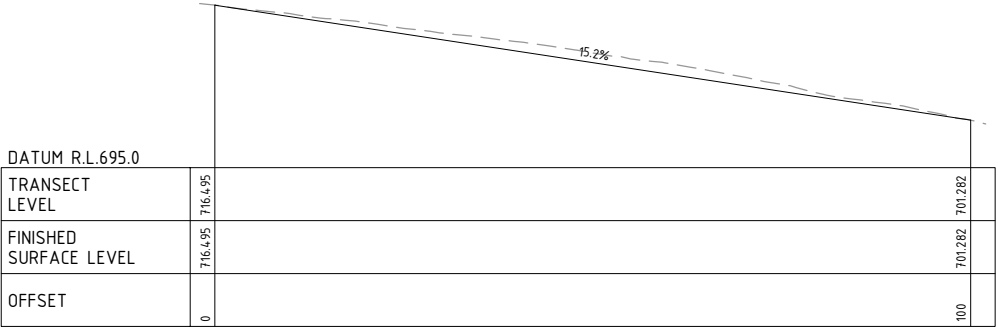
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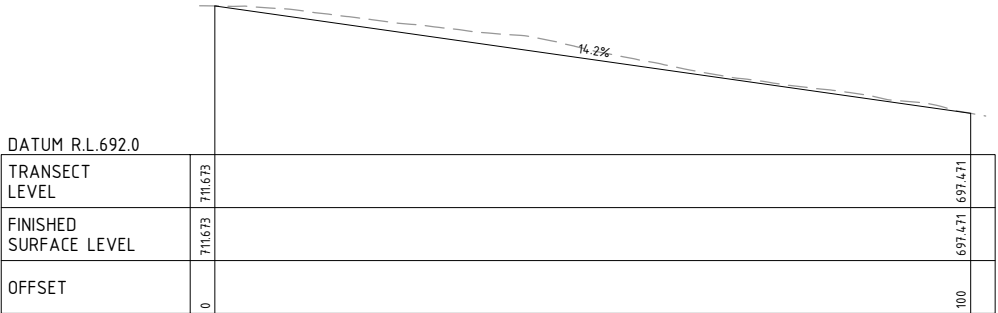
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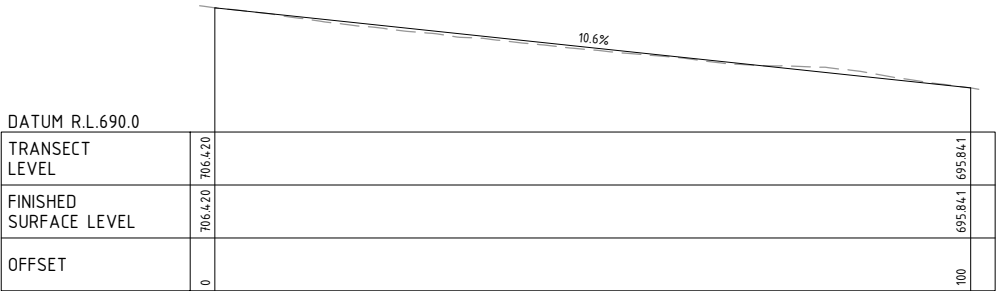
TRANSECT - 11



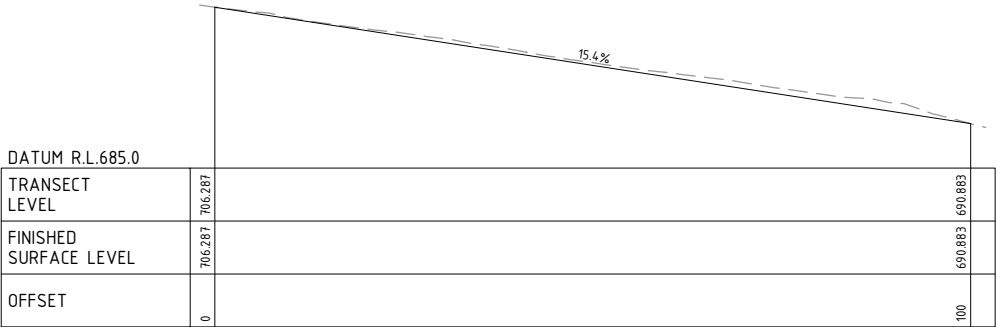
TRANSECT - 18



TRANSECT - 17



TRANSECT - 16



TRANSECT - 15



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0 5 10 15 20 25



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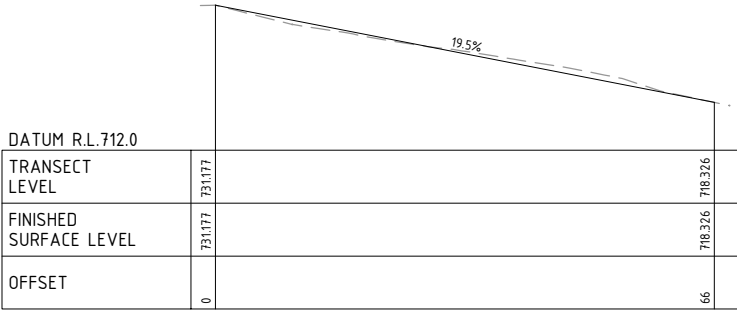
GOOGONG NH345 SKETCHES

BUSHFIRE SLOPE PLAN  
SHEET 4  
QPRC  
GOOGONG TOWNSHIP PTY LTD

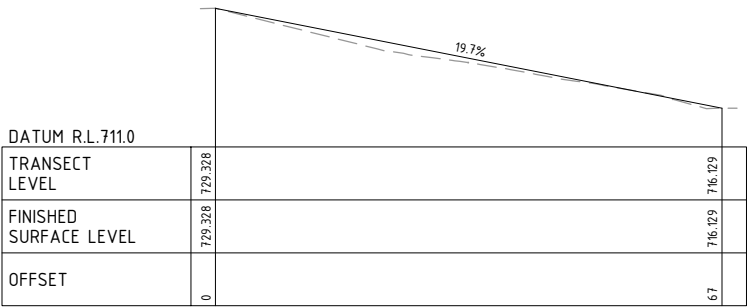
Drg No	Rev
308534CX328	----



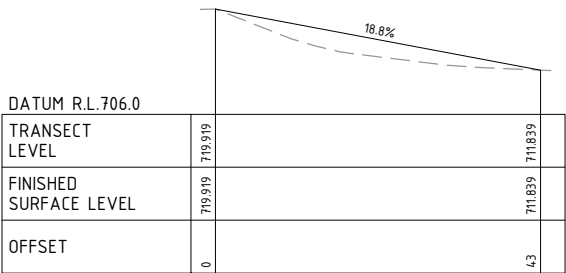
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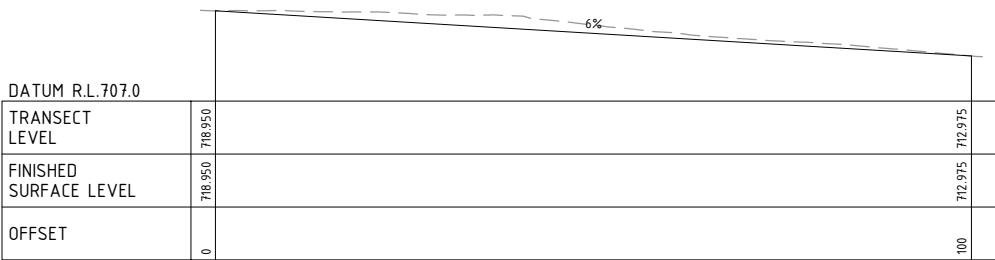
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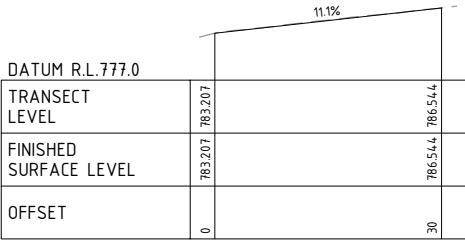
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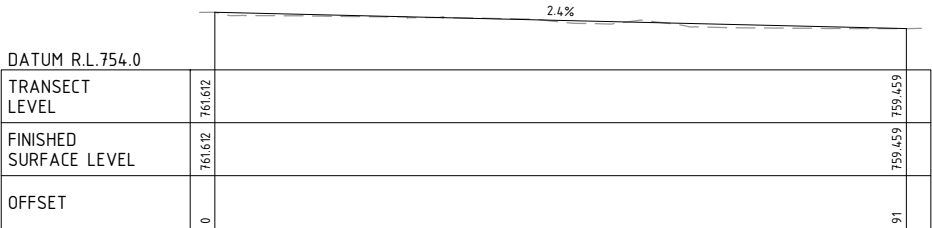
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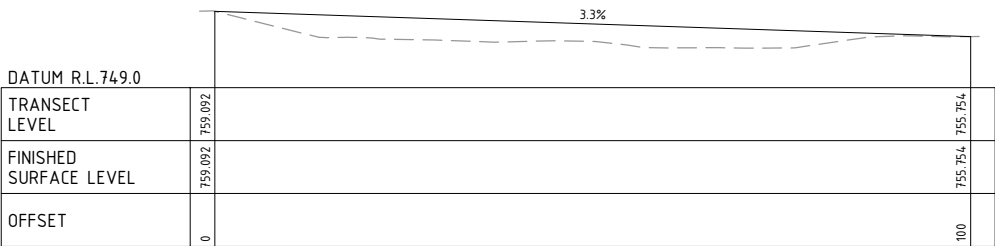
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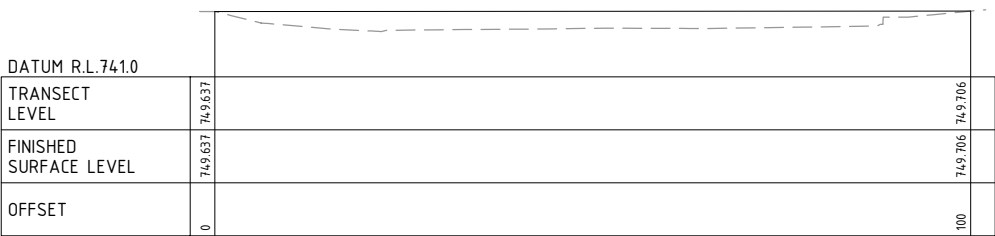
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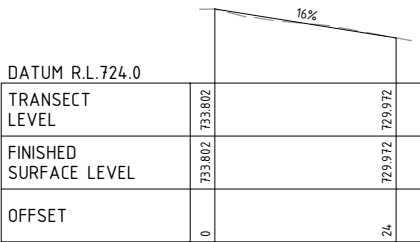
TRANSECT - 26



TRANSECT - 25



TRANSECT - 24



TRANSECT - 23



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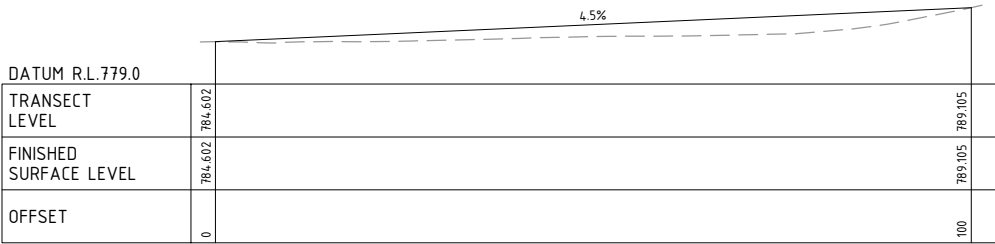
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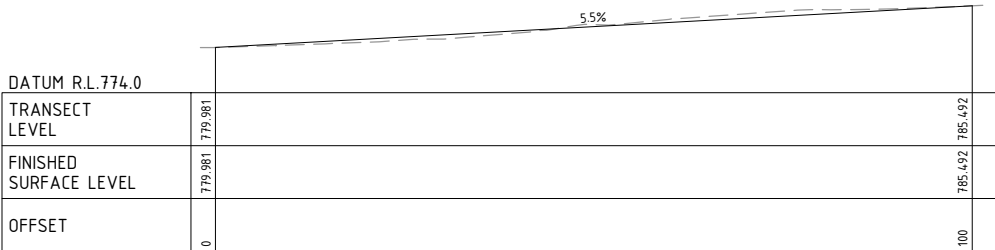
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SHEET 5  
QPRC  
GOOGONG TOWNSHIP PTY LTD

Drg No  
308534CX329  
Rev  
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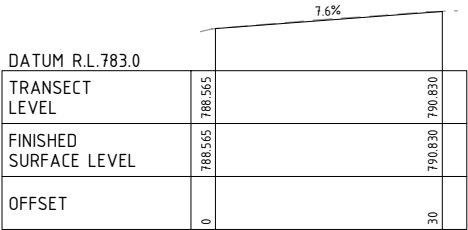
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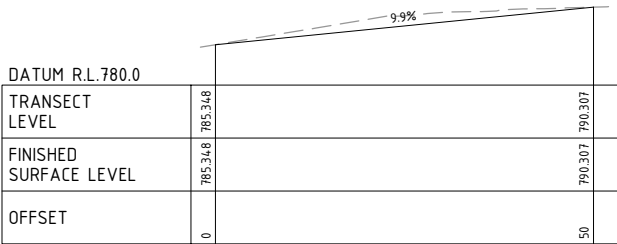
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TRANSECT - 30



TRANSECT - 29



TRANSECT - 28



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SHEET 6  
QPRC  
GOOGONG TOWNSHIP PTY LTD

Drg No	Rev
308534CX330	----

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LEGEND

DA BOUNDARY

NEIGHBOURHOOD BOUNDARY

BAL 29 LINE

FINISHED SURFACE CONTOURS  
- 1.0m MINOR INTERVALS

FLAME ZONE

BAL 40

BAL 29

BAL 19

BAL 12.5

TEMPORARY APZ

PROPOSED WSUD ASSET



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0 5 10 15 20 25  
0 5 10 15 20 25



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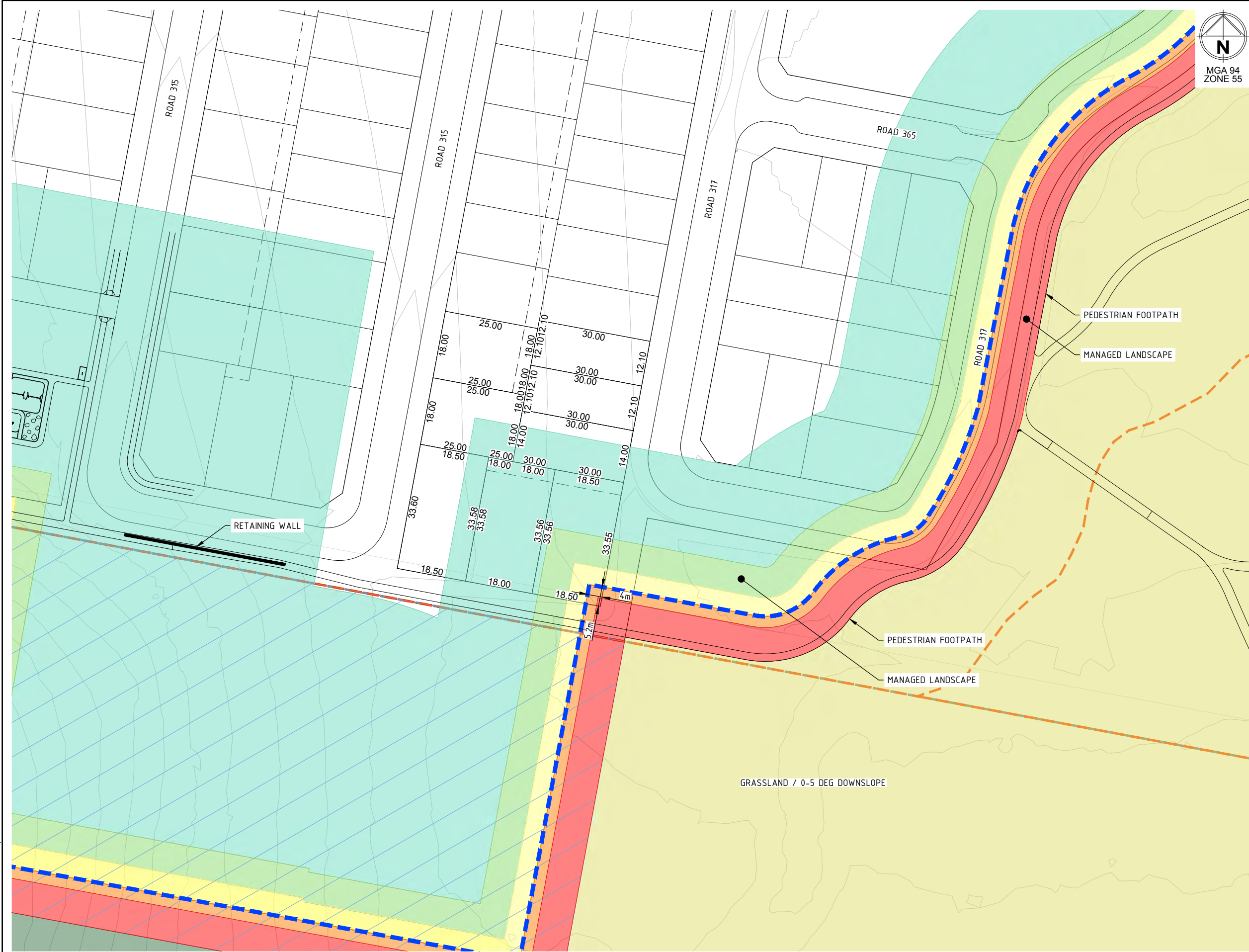
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BAL CONTOURS  
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QPRC  
GOOGONG TOWNSHIP PTY LTD

Drg No  
308534CX330  
Rev  
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- LEGEND**
- DA BOUNDARY
  - NEIGHBOURHOOD BOUNDARY
  - BAL 29 LINE
  - FINISHED SURFACE CONTOURS  
- 1.0m MINOR INTERVALS
  - FLAME ZONE
  - BAL 40
  - BAL 29
  - BAL 19
  - BAL 12.5
  - TEMPORARY APZ
  - PROPOSED WSUD ASSET



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**GOOGONG NH345 SKETCHES**

**BAL CONTOURS**  
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Drg No  
**308534CX331**

Rev  
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- LEGEND**
- DA BOUNDARY
  - NEIGHBOURHOOD BOUNDARY
  - BAL 29 LINE
  - FINISHED SURFACE CONTOURS  
- 1.0m MINOR INTERVALS
  - FLAME ZONE
  - BAL 40
  - BAL 29
  - BAL 19
  - BAL 12.5
  - TEMPORARY APZ
  - PROPOSED WSUD ASSET



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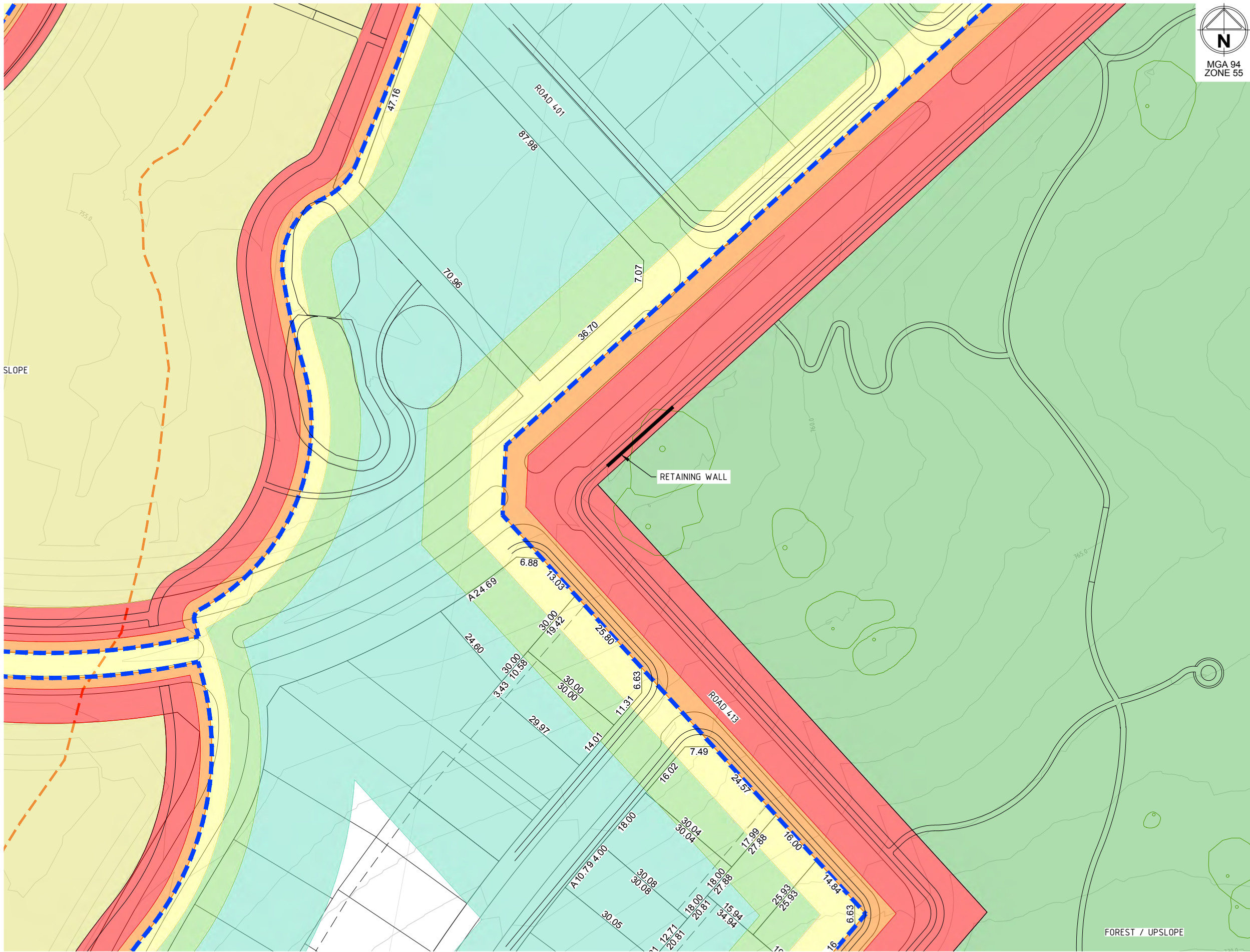
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**BAL CONTOURS**  
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QPRC  
GOOGONG TOWNSHIP PTY LTD

Drg No  
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Rev  
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- LEGEND**
- DA BOUNDARY
  - NEIGHBOURHOOD BOUNDARY
  - BAL 29 LINE
  - FINISHED SURFACE CONTOURS  
- 1.0m MINOR INTERVALS
  - FLAME ZONE
  - BAL 40
  - BAL 29
  - BAL 19
  - BAL 12.5
  - TEMPORARY APZ
  - PROPOSED WSUD ASSET



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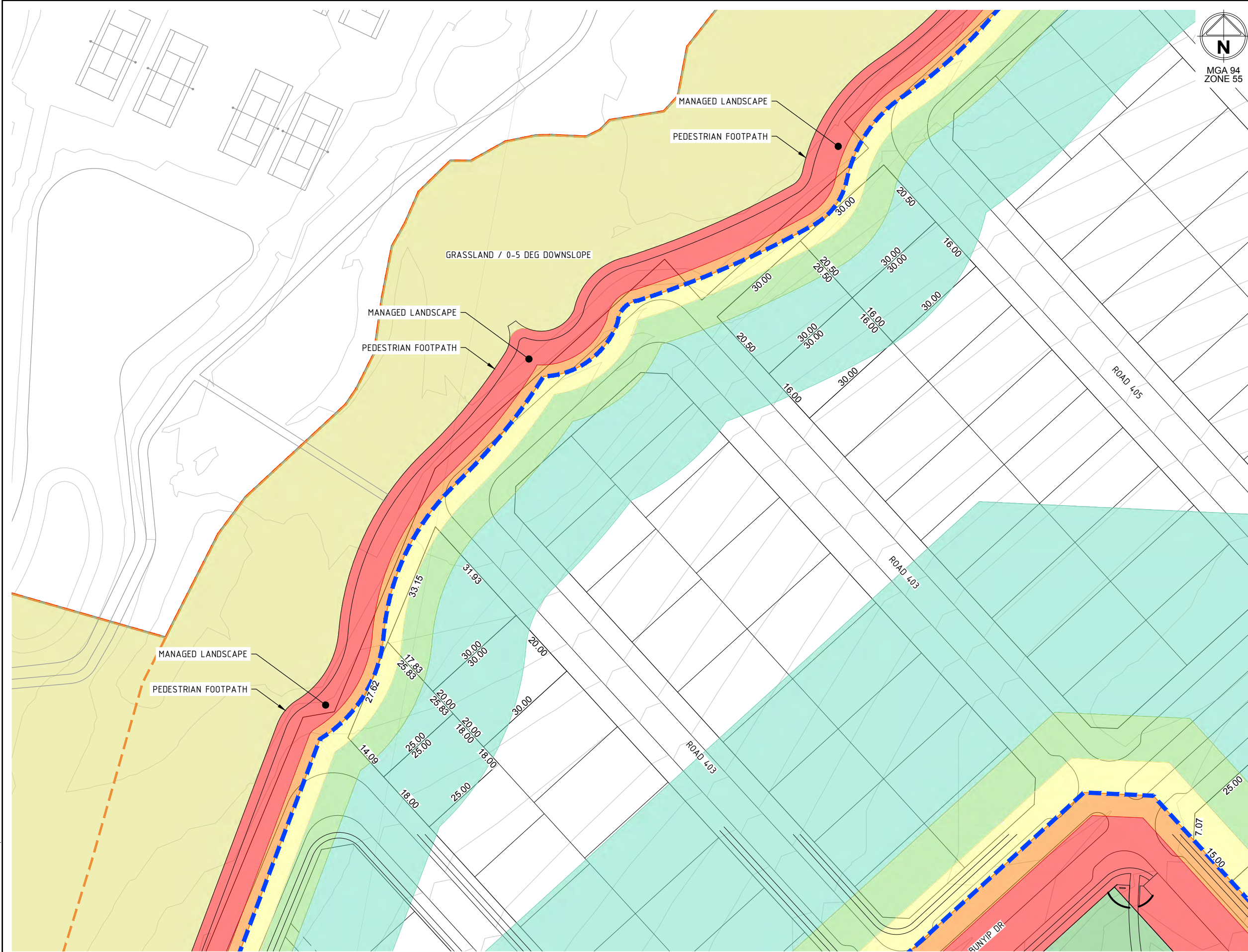
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**BAL CONTOURS**  
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QPRC  
GOOGONG TOWNSHIP PTY LTD

Drg No  
**308534CX333**  
Rev  
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- LEGEND**
- DA BOUNDARY
  - NEIGHBOURHOOD BOUNDARY
  - BAL 29 LINE
  - FINISHED SURFACE CONTOURS  
- 1.0m MINOR INTERVALS
  - FLAME ZONE
  - BAL 40
  - BAL 29
  - BAL 19
  - BAL 12.5
  - TEMPORARY APZ
  - PROPOSED WSUD ASSET



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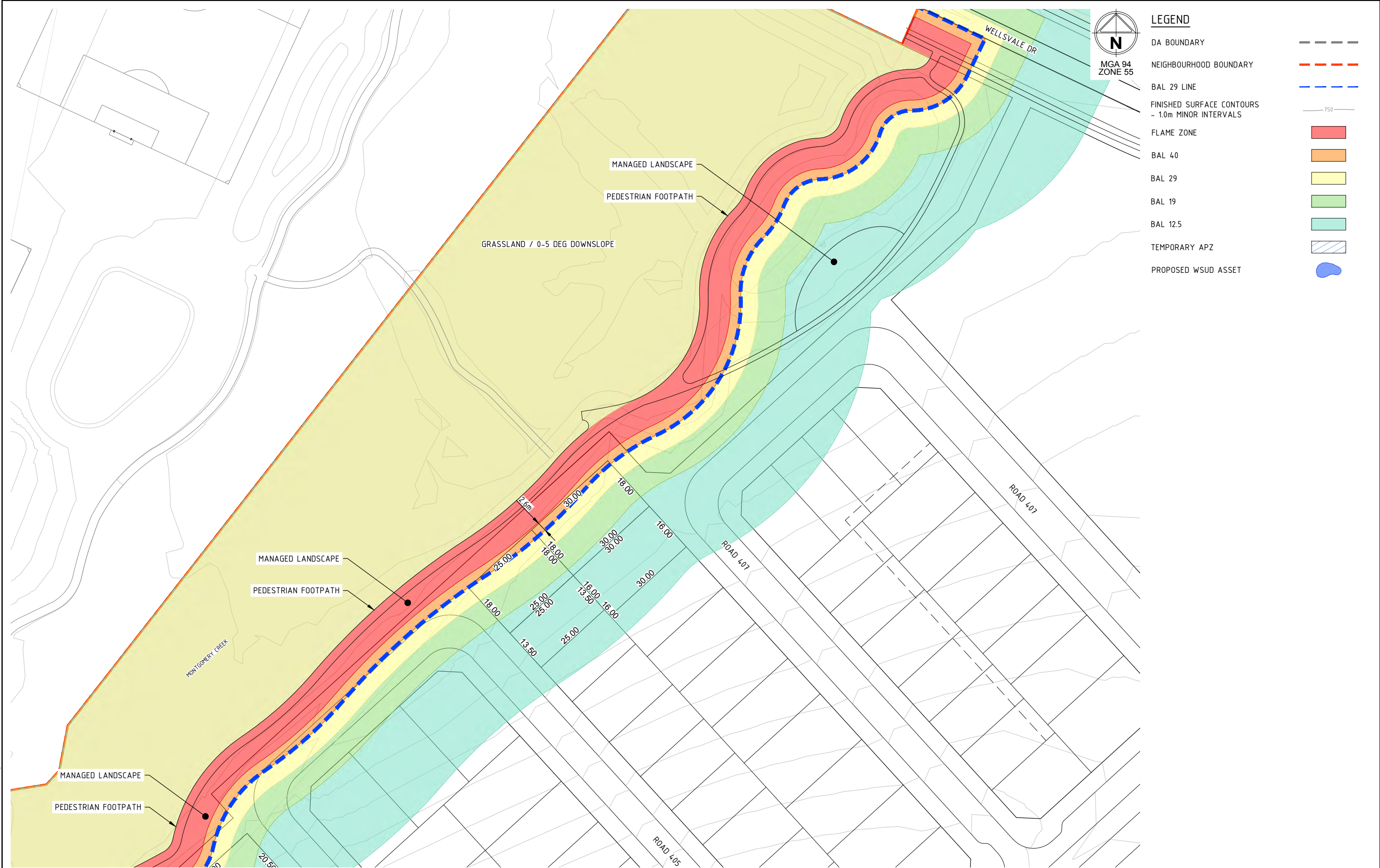
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QPRC  
GOOGONG TOWNSHIP PTY LTD

Drg No  
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Rev  
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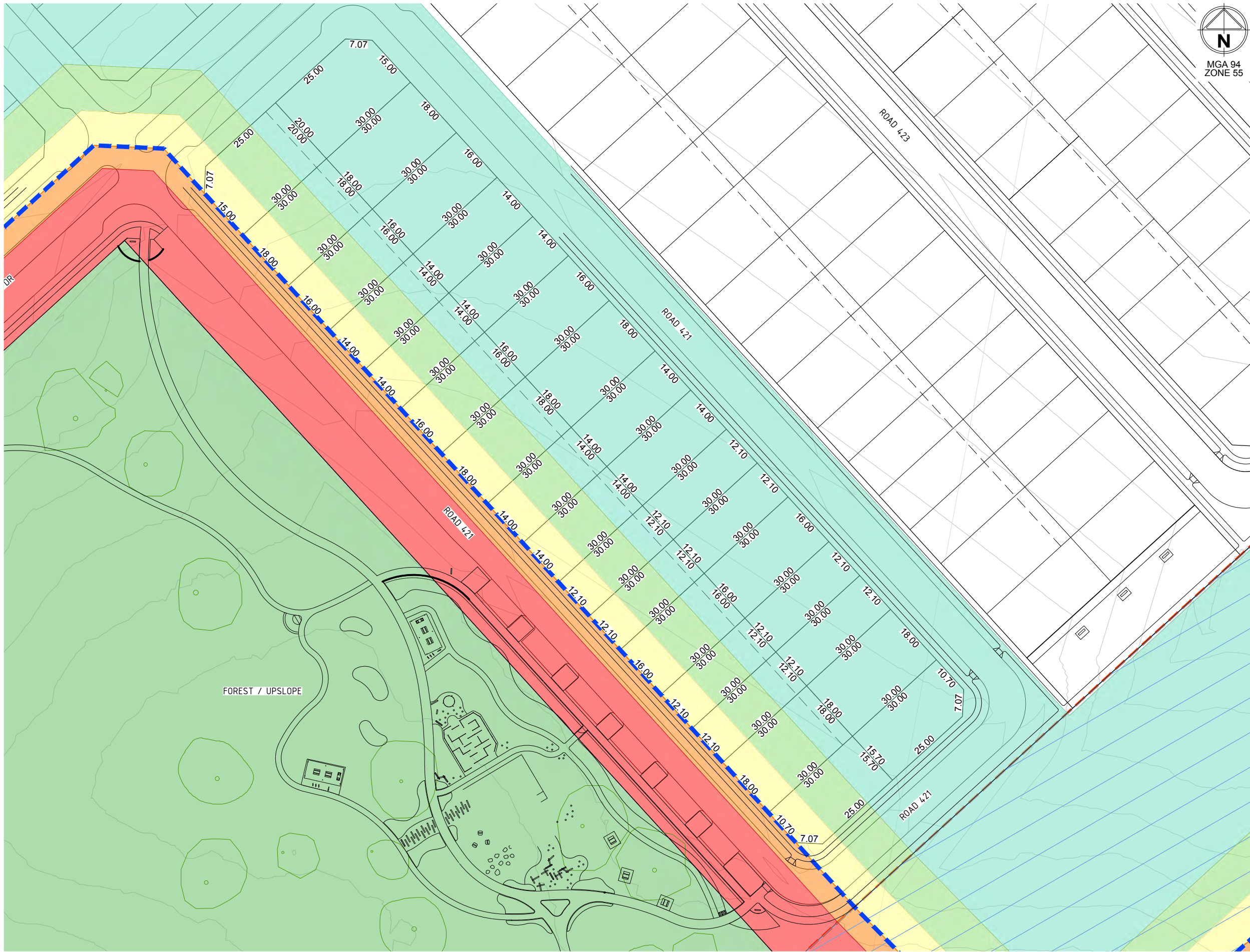
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QPRC  
GOOGONG TOWNSHIP PTY LTD

Drg No  
**308534CX335**  
Rev  
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LEGEND

- DA BOUNDARY
- NEIGHBOURHOOD BOUNDARY
- BAL 29 LINE
- FINISHED SURFACE CONTOURS  
- 1.0m MINOR INTERVALS
- FLAME ZONE
- BAL 40
- BAL 29
- BAL 19
- BAL 12.5
- TEMPORARY APZ
- PROPOSED WSUD ASSET



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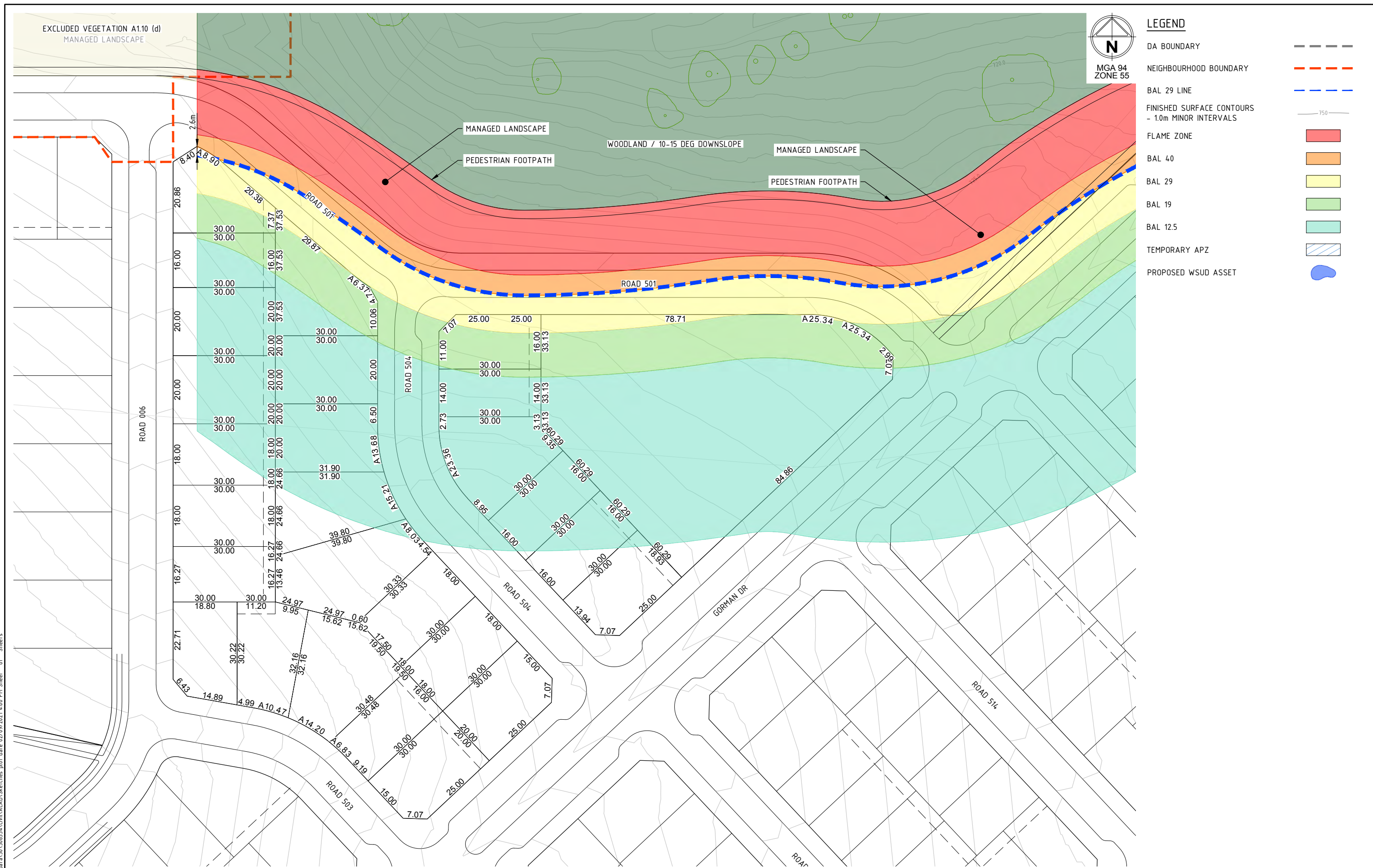
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GOOGONG NH345 SKETCHES

BAL CONTOURS  
QPRC  
GOOGONG TOWNSHIP PTY LTD

Drg No  
308534CX336  
Rev  
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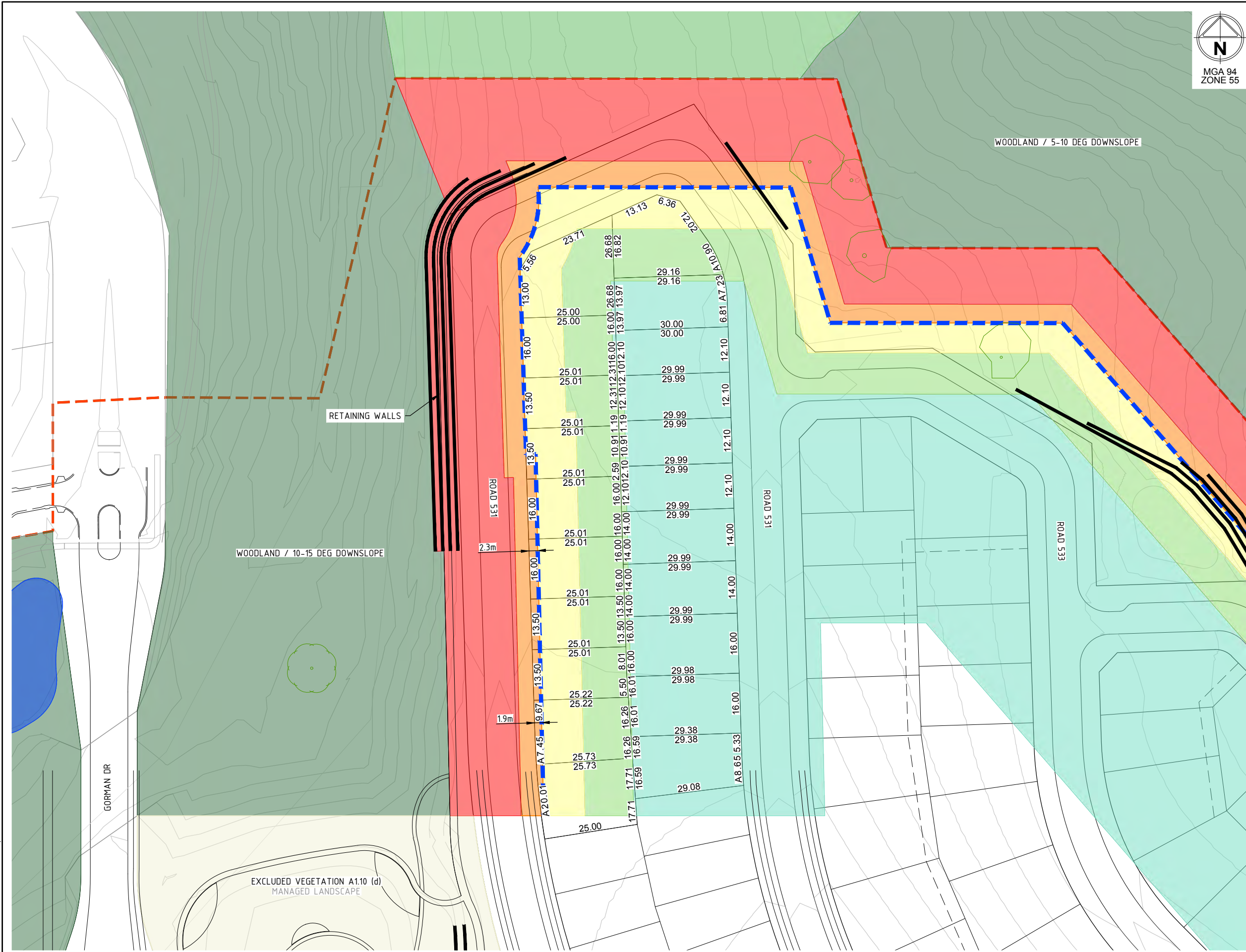


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GOOGONG TOWNSHIP PTY LTD



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LEGEND

- DA BOUNDARY
- NEIGHBOURHOOD BOUNDARY
- BAL 29 LINE
- FINISHED SURFACE CONTOURS - 1.0m MINOR INTERVALS
- FLAME ZONE
- BAL 40
- BAL 29
- BAL 19
- BAL 12.5
- TEMPORARY APZ
- PROPOSED WSUD ASSET



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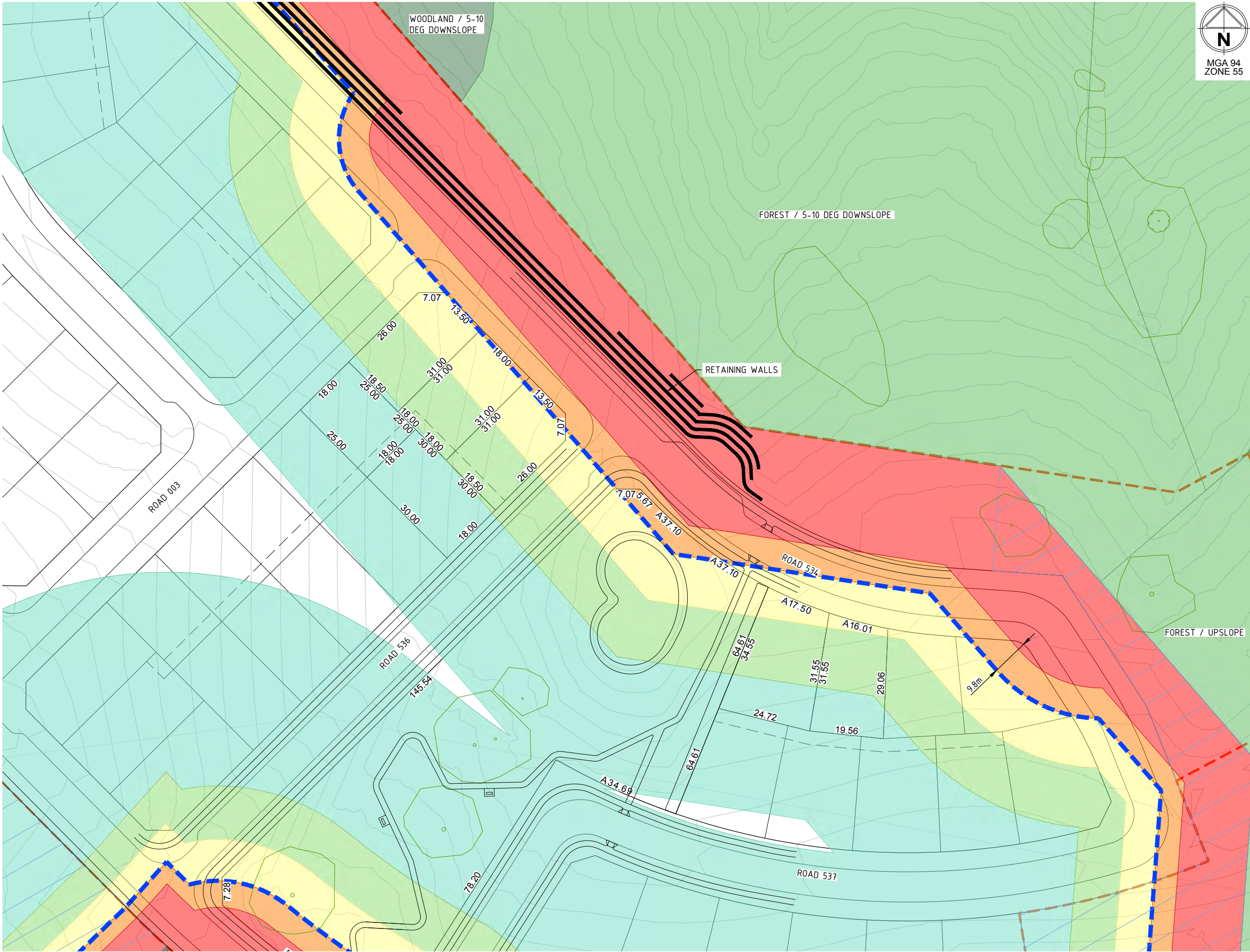
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QPRC  
GOOGONG TOWNSHIP PTY LTD

Drg No  
308534CX338  
Rev  
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LEGEND

- DA BOUNDARY
- NEIGHBOURHOOD BOUNDARY
- BAL 29 LINE
- FINISHED SURFACE CONTOURS  
- 1.0m MINOR INTERVALS
- FLAME ZONE
  - BAL 40
  - BAL 29
  - BAL 19
  - BAL 12.5
- TEMPORARY APZ
- PROPOSED WSUD ASSET



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