BUSHFIRE RISK ASSESSMENT

109 Lot Subdivision (105 Residential Lots, Village Centre and Public Open Space)

Lot 1 DP 1021332 &
Part Lot 458 DP 1063107
George Evans Road
Mundamia 2541

4 December 2012
Reference: 102166

Certified Business
Bushfire Planning & Design

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LOT 1 DP 1021332 & PART LOT 458 DP 1063107
GEORGE EVANS ROAD, MUNDAMIA

Prepared By: _____
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Reviewed By: _____
Tom Cook (B.Plan)
Town Planner

Date: 4th December 2012

This report has been prepared for for Shoalhaven City Council and Nowra Local Aboriginal Land Council the landowners of Lot 1 DP 1021332 & Part Lot 458 DP 1063107 George Evans Road, Mundamia, in accordance with Planning for Bushfire Protection - A Guide for Councils, Planners, Fire Authorities and Developers, 2006, NSW Rural Fire Service (RFS) and Planning NSW.

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Attachments

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1 INTRODUCTION

This Bushfire Risk Assessment has been prepared on behalf Shoalhaven City Council and Nowra Local Aboriginal Land Council to support a development application for a proposed subdivision of Lot 1 DP 1021332 & Part Lot 458 DP 1063107 George Evans Road, Mundamia. The proposal seeks approval under Part 3A of the Environmental Planning and Assessment Act 1979 to construct a 109 lot subdivision of the subject land (**Attachment 1**). The subdivision comprises a village centre, public open spaces and a mixture of residential lots ranging in size and densities to provide for a variety of housing types. All the proposed residential lots will be Torrens Title lots and the proposed subdivision will be constructed and released in eight (8) stages (**Attachment 2**).

For this assessment the proposal is considered to be a residential subdivision and if not for section 75U of the EP&A Act 1979 would require a Section 100B Bushfire Safety Authority under the Rural Fires Act 1997. Regardless of this Bushfire Risk Assessment has been prepared in accordance with Clause 44 of the Rural Fires Regulation 2008, which specifies the information requirements for consideration of a bush fire safety authority under section 100B of the RF Act 2008.

Shoalhaven Council's Bushfire Prone Land Map indicates that both lots are bushfire prone (Figure 1), with Lot 1 DP 1021332 affected by category 1 vegetation and associated buffer and Part Lot 458 DP 1063107 affect by category 1 vegetation.

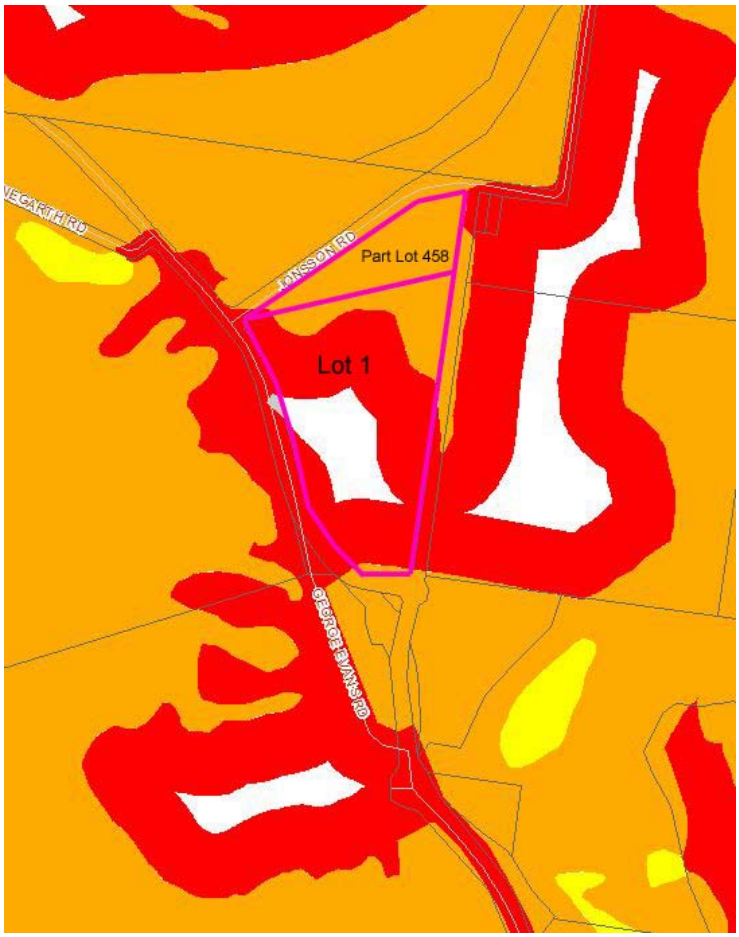

Figure 1: Shoalhaven Bushfire Prone Land Map. The subject lots are outlined in pink.

The assessment of the site is based on the results of a field survey conducted by David Cannon on Thursday 8th November 2012. The following current legislation and guidelines were referred to when preparing this report:

- Planning for Bushfire Protection, A Guide for Council, Planner, Fire Authorities and Developers' (NSW Rural Fire Service (RFS) in cooperation with the Department of Planning (2006);
- Rural Fires Act 1997;
- Australian Standard 3959-2009 Construction of Buildings in Bushfire Prone Areas; and
- Rural Fires Amendment Regulation 2008.

NOTE: *that the 'Planning for Bushfire Protection, A Guide for Council, Planners, Fire Authorities, and Developers (NSW Rural Fire Service (RFS) in cooperation with the Department of Planning (NSW) (2006)' mentioned above, will herein be referred to as the* ***'PBP 2006'****.*

1.1 OBJECTIVES

All development on Bushfire Prone Land must satisfy the aim and objectives of PBP 2006. PBP 2006 states:

"The aim of PBP is to use the NSW development assessment system to provide for the protection of human life (including firefighters) and to minimise impacts on property from the threat of bushfire, while having due regard to development potential, on-site amenity and protection of the environment.

More specifically, the objectives are to:

a) afford occupants of any building adequate protection from exposure to a bushfire;
b) provide for a defendable space to be located around buildings;
c) provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;
d) ensure that safe operational access and egress for emergency service personnel and residents is available;
e) provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the asset protection zone (APZ); and
f) ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bushfire fighting").

This assessment includes an analysis of the potential hazard persisting and affecting the subject site and the standards and bushfire mitigation measures that should be introduced to address the objectives of the PBP 2006 and AS3959-2009. The mitigation measures have been derived from the provisions (performance criteria and acceptable solutions) as outlined within the PBP 2006 and AS3959-2009.

1.2 PROPOSAL

The proposal seeks approval under Part 3A of the Environmental Planning and Assessment Act 1979 to construct a 109 lot subdivision of the subject land (**Attachment 1**). The subdivision comprise a village centre, public open spaces and a mixture of residential lots ranging in size and densities to provide for a variety of housing types. All the proposed residential lots will be Torrens Title lots and

the proposed subdivision will be constructed and released in eight (8) stages (**Attachment 2**). Access to the residential development is proposed via a realigned George Evans Road. A roundabout is proposed to be provided at the entrance to the development, which will also provide access to the new school east of the realigned George Evans Road.

The subdivision layout has been designed to capitalise on the natural attributes of the area while protecting the environmentally sensitive parts of the site. The proposed subdivision will create one hundred and nine (109) Torrens Title allotments covering 9.7ha of the 12.3ha site. The proposal also includes a number of allotments that will contain public open space and a village centre proposed to include neighbourhood shops, a community centre and a child care centre. The different types of proposed lots are indicated in Table 1:

Table 1: Breakdown of the different types of proposed lots

Lot Type	Number of Lots
Residential (detached low density)	94
Residential (dual occupancy)	5
Residential (medium density)	6
Village Centre (Neighbourhood Shops/Community Facility)	1
Public Open Space	3

The proposed residential allotments and the configuration of roads are shown in Figure 1 and on the subdivision layout plan (Attachment 1). The subdivision layout will result in the unformed parts of the existing roads; 'George Evans Road', 'Jonsson Road' and the unformed Crown Road being upgraded to provide access to the new residential allotments and new roads being created to provide access to the allotments.

Figure 1: Subdivision Layout Plan

The proposed subdivision will be constructed and released in eight (8) stages (Attachment 2) as shown in Figure 2 and described below. The timing for the release of the each stage will depend upon market conditions and financing.

Figure 2: Subdivision Staging Plan

Stage 1 - Lots 1 to 18 and 25 (Public Reserve)

- Remediate the whole site i.e remove the contaminate fill material.
- Clear vegetation from the site.
- Import the required fill material and re-grade the site to final land form (i.e contours).
- Establish the public open space (Lot 25) and associated OSD, retention and wetland.
- Construct the following roads and associated drainage (i.e bio-retention swales):
    - Part of the Spine Road to Lot 24
    - All of Road 6;
    - Road 1 from George Evans Road to Road 2
    - Road 2 from Spine Road to Road 1.
    - Lane 1.
    - George Evans Road adjacent to Lot 1 to 4. (Note: kerb and guttering on only on our side of the road and may be a 6m pavement).
- Re-route the electrical services (potential along George Evans Road or Road 2).
- Establish (provide services) and release lots 1 to 18.
- Dedicate the 5m of road widening.
- Existing ROW over Lot 1 to be released.

- Easement will be required over the Lot 473 DP1102909 (NLALC) to allow connection into the water main.

Stage 2 - Lots 19 to 23, 40 – 45 and 60 - 64

- Construct the following roads and associated drainage (i.e bio-retention swales):
  - Road 1 from Road 2 to Road 3
  - Road 2 from George Evans Road to Road 1.
  - George Evans Road adjacent to Lot 19 to 45.
- Establish (provide services) and release lots 19 to 23, 40 – 45 and 60 - 64.

Stage 3 - Lots 33 to 39

- Construct the following roads and associated drainage (i.e bio-retention swales):
  - Road 3 from Road 1 to Road 5.
  - Road 4 from Road 1 to Road 5
  - Road 5 from Road 3 to Road 4.
- Establish (provide services) and release lots 33 to 39.
- Construct retention/OSD Basin within Part Lot 458.
- Interim easements for APZ to be created over residual lot.

Stage 4 - Lots 26 to 32 and Village Centre (Lot 24)

- Construct the following roads and associated drainage (i.e. bio-retention swales):
  - Road 1 from Road 3 to Road 4.
  - Road 3 from the Spine Road to Road 5.
  - Road 4 from Spine Road to Road 5.
  - Spine road from village centre to Road 4
- Establish (provide services) and release lots 26 to 32.
- Establish village centre.
- Establish retention basin and pedestrian access within Lot 77.

Stage 5 - Lots 46 to 59

- Construct the following roads and associated drainage (i.e. bio-retention swales):
  - Road 1 from Road 4 to Jonsson Road.
  - George Evans Road adjacent to Lots 46 to 51.
  - Jonsson Road from George Evans Road to Road 1.
- Establish (provide services) and release lots 46 to 59.
- Dedication of the Public reserve lot (Lot 25).
- Interim easements for APZ to be created over residual lot

Stage 6 - Lots 73 to 84

- Construct the following roads and associated drainage (i.e. bio-retention swales):
  - Spine Road (unformed crown road) from Road 4 to Jonsson Road
  - Jonsson Road adjacent to Lots 83 and 84.

- Establish (provide services) and release lots 73 to 84.
- Dedication of retention basin and pedestrian access within Lot 77.
- Interim easements for APZ to be created over residual lot

Stage 7 - Lots 65 – 69 and 101 - 109

- Construct the following roads and associated drainage (i.e. bio-retention swales):
  - Road 5.
- Establish (provide services) and release lots 65 – 69 and 101 - 109.
- Overland and pedestrian access within Lot 90.
- Interim easements for APZ to be created over residual lot

Stage 8 – Lots 85 - 100

- Construct the following roads and associated drainage (i.e bio-retention swales):
  - Jonsson Road from Road 1 to 85.
- Establish (provide services) and release lots 85 -100.

2 PROPERTY DETAILS

2.1 DESCRIPTION OF PROPERTY

The subject site is described as Lot 1 DP 1021332 and Part Lot 458 DP 1063107 George Evans Road, Mundamia. Mundamia is located approximately 4km south west of the Nowra CBD (Figure 1.2) and consists of predominantly rural land, including the University of Wollongong Shoalhaven Campus. The subject site is located approximately 200m north of the University Campus and approximately 300m south of the Shoalhaven River. The overall site, which consists of Lot 1 DP 1021332 and Part Lot 458 DP 1063107, comprises an irregular shaped area of some 11.7ha with maximum north-south and east-west dimensions of 600m and 330m respectively (Figure 1).

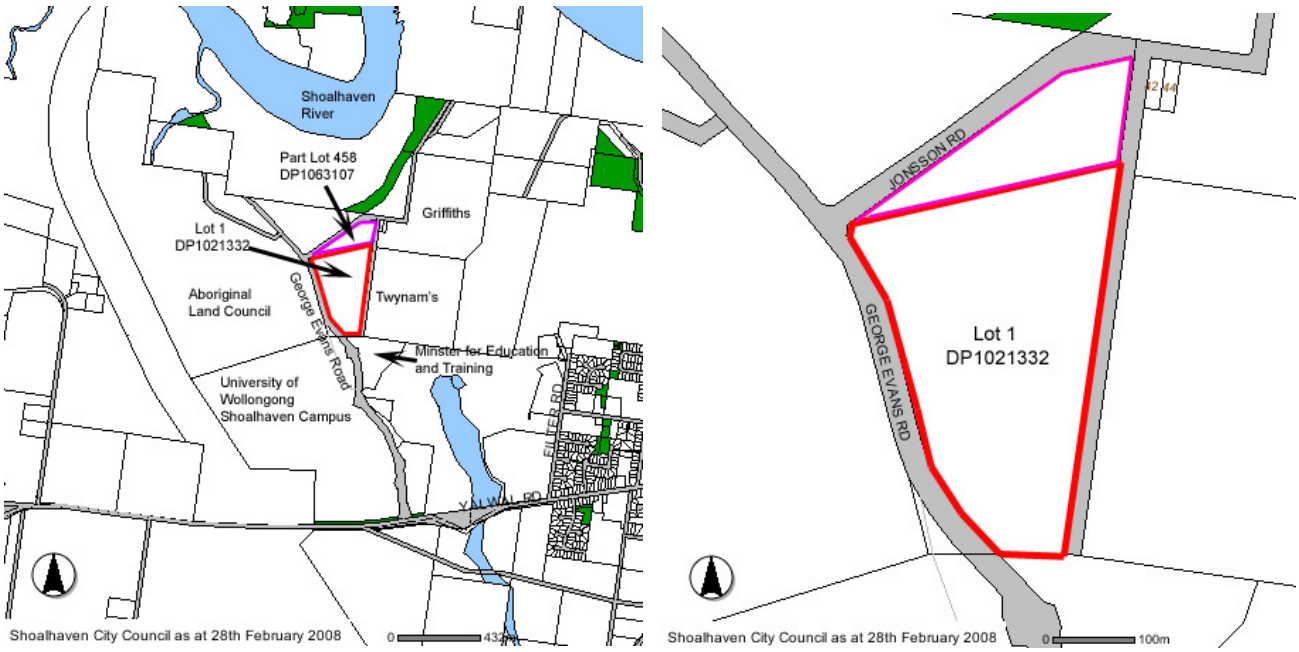

Figure 1: Locality Context Plan

The site is located just to the south of the Shoalhaven River on rural land that is predominantly vegetated with an array of flora species. An electrical easement runs through southern section on the site in a north west to south east direction. The subject site is generally bounded by George Evans Road and native vegetation to the west; native vegetation and Jonsson Road to the north; cleared rural land to the east and native vegetation to the south. Part Lot 458 DP 1063107, owned by the Nowra Aboriginal Land Council, occupies the northern section of the proposed development and is irregular in shape with a total area of 2.82ha. Adjoining Lot 458 to the south is Lot 1 DP 1021332. Owned by Shoalhaven City Council Lot 1 is irregular in shape with a total area of 9.49ha.

The site is currently unoccupied and consists of a large area of severely disturbed land primarily as the result of previous quarrying activities (soil and sandstone extraction). The vegetation on the site comprises predominantly Scribbly Gum - Bloodwood Woodland around the outer edges of the area previously affected by the quarrying operation and in the north western corner. The native vegetation regeneration in the disturbed area is limited and comprises a combination of exotic grass and sandstone outcrops.

Figure 2: Aerial photograph showing subject site.

The site lies at an altitude of approximately 60-70 m Australian Height Datum (AHD) and forms part of a sandstone plateaux. The site is generally level to very gentle sloping land, however, there are some steeper down slopes (approximately 3° - 5°) located around the edge of the area previously affected by the quarrying operation. The land overall generally slopes in a north westerly direction.

The site according to the Wollongong 1:250 000 Geological Series Sheet is underlain by the Nowra Sandstone formation, a thick to very thickly bedded sequence of coarse grained quartzone sandstone with pebbly and conglomeratic horizons. This rock unit is part of the Shoalhaven Group of Permian age. Soils are generally shallow over most of the site especially in the area previously affected by the quarrying operation. The site contains numerous sandstone rock outcrops. Soils are typically a sandy loam and sand of the Nowra Soil Landscape. According to Hazelton (1992) the

crests and upper slopes have up to 40cm hardsetting dark reddish brown loam fine sandy overlies <30cm dark sandy clay, which overlies <30cm bright brown moderately pedal light medium clay. The midslopes have up to 10cm loose yellowish brown sand or hardsetting gravelly massive yellow brown clayey sand overlies <20cm brown sandy clay loam overlies <100cm bright brown moderately pedal light medium clay. The lower slopes and drainage lines have up to 15cm loose yellowish brown sand overlies <15cm brown sandy clay loam, which overlies <70 cm light clay with mottles. The soil profile generally has a low to moderate fertility. Topsoils are generally hardsetting. The soils are often moderately deep but are stony, strongly to moderately acid with generally low CEC. The topsoils generally have a low erodiblility, while the subsoil has a high erodibility (Hazelton, 1992).

2.2 CLASS OF VEGETATION

The vegetation types have been classified using the formations and sub-formations provided in Table A2.1 of the bushfire guideline. Vegetation descriptions are as per Keith D, 2004 in Keith (2004) "Ocean Shores to Desert Dunes" published by DECC (except heathlands which is provided two sub-formations rather than one based largely on vegetation height) the main categories are as follows:

- Forests (wet sclerophyll forests and dry sclerophyll forests;
- Woodlands;
- Forested wetlands;
- Tall heaths;
- Freshwater wetlands
- Short heaths;
- Alpine complex;
- Semi-arid woodlands;
- Arid shrublands;
- Rainforests; and
- Grasslands.

Where a mix of vegetation types exist the type providing the greatest bushfire hazard has been used. Vegetation that is to be cleared as part of the development has not been included in this assessment. It should also be noted that remnant vegetation (a parcel of vegetation < 1 ha or fire run of < 50m) and Riparian vegetation are considered a low hazard and APZ setbacks and building construction standards for these will be the same as required for rainforest vegetation.

As part of this assessment the following are not considered a hazard or a predominant vegetation class/formation and can be included within an asset protection zone:

(a) non-vegetated areas including roads, footpaths, cycleways, waterways, buildings, rocky outcrops and the like; and

(b) reduced vegetation including maintained lawns, golf course fairways, playgrounds or sports fields, vineyards, orchards, cultivated ornamental gardens and commercial nurseries.

In accordance with the Addendum to Appendix 3 of the PBP (2010) the vegetation classifications have been converted from David Keith's to the AUSLIG Pictorial Analysis in AS3959-2009. This

conversion is based on what is considered the best representation of similar bush fire behaviour potential.

David Keith's *Ocean Shores to Desert Dunes*	AUSLIG (1990) Pictorial Analysis (AS3959-2009)
Forests (Wet & Dry Sclerophyll)	*Forest*
Pine Plantations	
Forested Wetlands	
Woodlands (Grassy, Semi-Arid)	*Woodland*
Tall Heath (Scrub)	*Scrub*
Freshwater Wetlands	
Short Heath (Open Scrub)	*Shrubland*
Arid Shrubland	*Mallee/Mulga*
Alpine Complex (Sedgelands)	*Tussock Moorland*
Rainforest	*Rainforest*
Grassland	*Grassland*

The details of the predominant vegetation in all directions, to a distance of 140m from the proposed lots are provided in **3.2**.

The wider Mundamia urban release area contains four native vegetation communities as indicated in Figure 3 including: Scribbly Gum – Blackwood Woodland; Grey Gum – Stringybark Forest/Woodland; Kunzea Shrubland/Heathland; and Paperbark Closed Forest. The majority of the Lot 1 DP 1021332 has been severely disturbed by the quarry operations and comprises regenerating vegetation, however the less disturbed areas in the north and north east and majority of Part Lot 458 DP 1063107 contain the Scribbly Gum – Bloodwood Woodland community. This community is dominated by Red Bloodwood *Corymbia gummifera* and Hard-leaved Scribbly Gum *Eucalyptus sclerophylla*, but also includes Grey Gum *Eucalyptus punctata*, Silvertop Ash *Eucalyptus sieberi* and White Stringybark *Eucalyptus globoidea* to a height of 12-15. The understorey is generally dominated by heathy shrubs such as Bushy Needlebush *Hakea sericea*, Mountain Devil *Lambertia formosa*, Swamp Banksia *Banksia paludosa*, Hairpin Banksia *Banksia spinulosa*, and Conesticks *Petrophile pedunculata*.

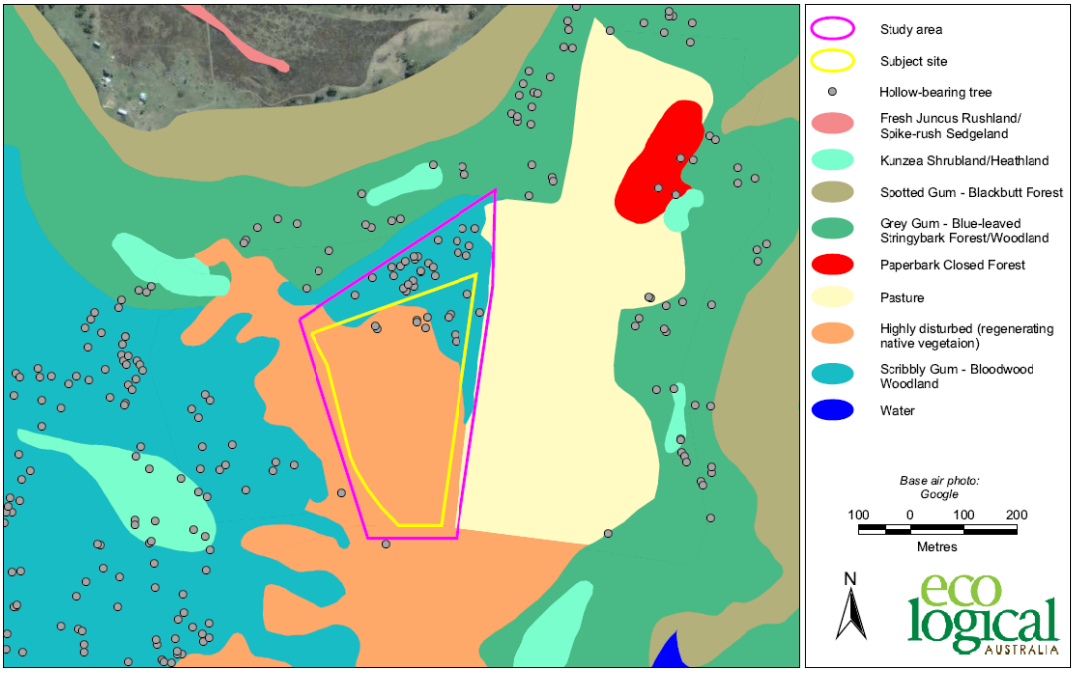

Figure 3: Vegetation Map of the Subject Land

The dominate vegetation from a bushfire perspective would be:

- The Scribbly Gum – Blackwood Woodland vegetation contained in the northern section of the site for stages 3, 4 6 and 7.
- The Scribbly Gum – Blackwood Woodland vegetation to the west of the site; and
- The Grey Gum – Stringybark Forest/Woodland to the north of the site.

2.3 ASSESSMENT OF SLOPE

The slope in all directions over a distance of 100m from the existing property boundary or building footprint has been assessed in terms of the following classes:

(i) all upslope vegetation (considered 0°)
(ii) >0 to 5° downslope vegetation
(iii) >5 to 10° downslope vegetation
(iv) >10 to 15° downslope vegetation
(v) >15 to 18° downslope vegetation.

During the assessment of the slope, if it was found that there were a number of different slope classes present over the 100m in any one direction, the slope of the area, which will most significantly influence the fire behavior, has been adopted.

The site is currently generally level to very gentle sloping land, however, there are some steeper down slopes (approximately 3° - 5°) located around the edge of the area previously affected by a small quarrying operation. The land overall generally slopes in a north westerly direction. As part of the proposed development the majority of the subject will be filled and re-graded, back to a more natural landform (Figure 4).

Figure 4: Final Landform.

The subject site is located on top of a small ridge, therefore the slopes radiates out from the site. The effective bushfire slopes are:

- 1 degree downslope in south to southwesterly direction;
- 1 degree downslope in a westerly direction;
- 4 degrees down slope in a northerly; and
- 1 degree downslope in a northerly direction within the subject site for stages 3, 4, 6 and 7.

The effective bushfire slope for any future dwelling on the lots will need to be determined once a dwelling location is chosen.

2.4 SIGNIFICANT ENVIRONMENTAL FEATURES

The Spring Tiny Greenhood Orchid and Nowra Heath Myrtle have been mapped outside of the subject site.

2.5 THREATENED SPECIES

There are no known threatened species on the subject land.

2.6 ABORIGINAL RELICS

There are no known aboriginal relics located on the subject land.

2.7 ZONING

The land is subject to the provisions of Shoalhaven Draft Local Environmental Plan (LEP) 2009. The land is zoned R1 – General Residential as shown in Figure 5. The objectives of the zone are:

- *To provide for the housing needs of the community*.
- *To provide for a variety of housing types and densities*.
- *To enable other land uses that provides facilities or services to meet the day to day needs of residents*.
- *To identify land suitable for future urban expansion*.

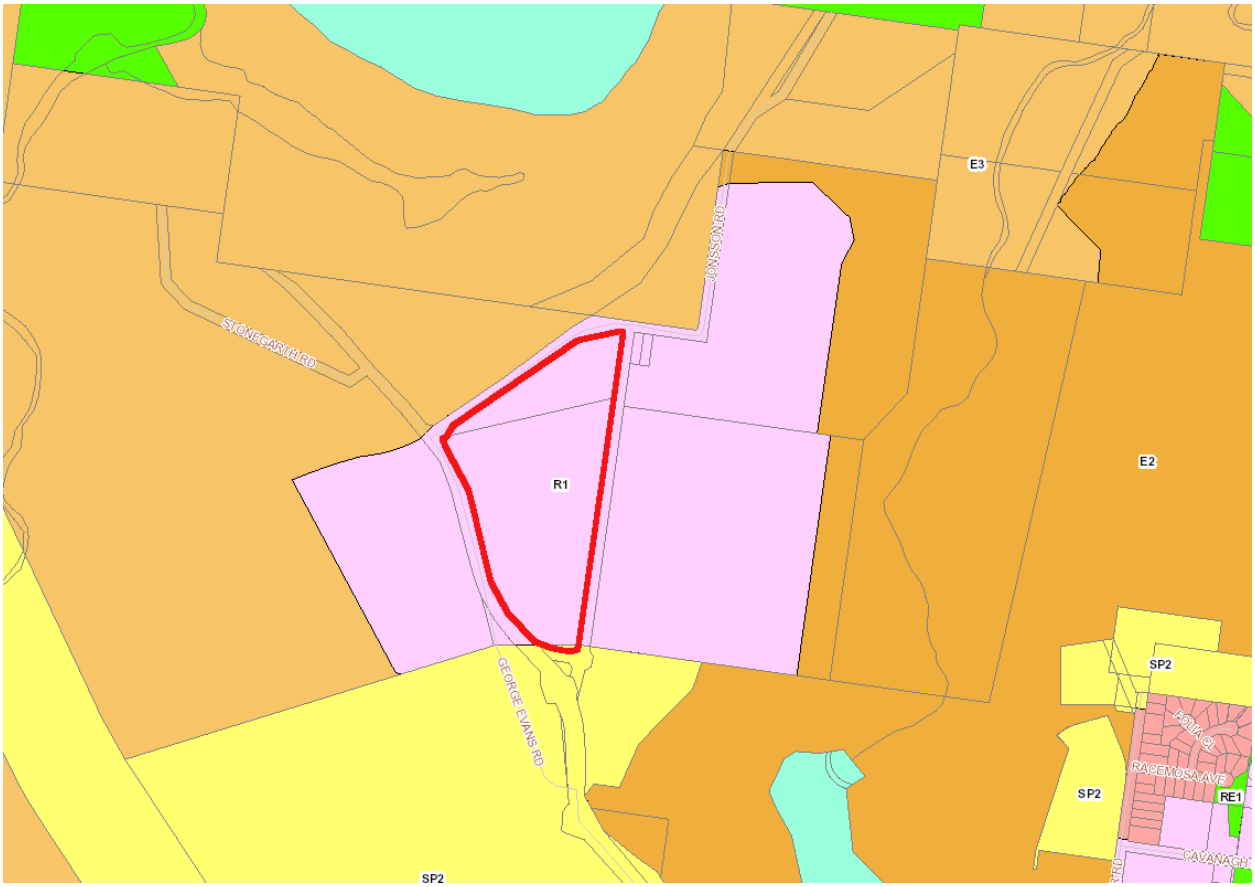

Figure 5: Zoning Plan

Although the subject site is currently zoned 1(d) – General Rural under LEP 1985, this proposal will be assessed under LEP 2009 and cannot be determined until such time as the new instrument is gazetted.

The proposed development utilises a range of residential lot sizes, from 439.8m^2 to 3517.9m^2. The variety in lot sizes provides the opportunity for a diverse range of housing styles and sizes to be development. The topography and setting of the site have been utilised in the design to ensure all future dwellings have as much practical, useable space as possible. The proposal was developed to minimise negative impacts on the environment and maximise benefits to the local community.

The proposal also includes a village centre which comprises of a community centre, child care centre and neighbourhood shops. These urban facilities and services will cater to the day to day needs of the residents of the new release area.

3 PROPERTIES ADEQUACY FOR BUSHFIRE PROTECTION

3.1 ASSESSMENT METHODOLOGY

A site inspection was conducted to determine the direction and scale of any potential bush fire event based on an analysis of slope, aspect, vegetation type and density, current fuel loading and evidence of past fire history.

The information contained in the appendices of the PBP 2006 has been used to categorise vegetation type and slope class in the locality, as discussed in Sections 2.2 and 2.3 of this report. Following on from this, Table A2.3 of the PBP 2006 was used to determine the appropriate fire area and corresponding FDI rating. The required Asset Protection were then determined using Table A2.4 of the PBP 2006 for each respective vegetation class.

3.2 SPECIFICATIONS FOR ASSET PROTECTION ZONE

The aim of APZs is to ensure there is a progressive reduction in flammable material towards any building. The intent of the measures are to provide sufficient space and maintain reduced fuel loads, so as to ensure radiant heat levels at buildings are below critical limits and to prevent direct flame contact with the building. The performance criteria and acceptable solutions for asset protection zones for subdivisions in accordance with PBP 2006 are provided in Table 1.

Table 1: Provides the performance criteria and acceptable solutions for APZ for residential subdivisions in accordance with PBP 2006.

Performance Criteria	Acceptable Solutions	Compliance
The intent may be achieved where:		
Radiant heat levels at any point on a proposed building will not exceed 29 kW/m^2	• An APZ is provided in accordance with Table A2.4 of Appendix 2 of PBP 2006. • The APZ is wholly within the boundaries of the development site.	ALL proposed lots comply with the APZ requirements of Appendix 2 of PBP 2006. Once fully developed the APZs will be contained within the subject site and the road reserves. However, during stages (3, 4 6 and 7) of the development interim easements will required of the residual lot.
APZs are managed and maintained to prevent the spread of a fire towards	APZs are managed and maintained in accordance with the requirements of	The APZs will be contained within the building line setbacks and the

Performance Criteria	Acceptable Solutions	Compliance
the building.	Standards for Asset Protection Zones (RFS, 2005).	road reserve and will not have any problem being maintained in accordance with the requirements of Standards for Asset Protection Zones (RFS, 2005).
APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	The APZ is located on lands with a slope less than 18 degrees.	The subject site does not have slopes in excess of 18 degrees.

Table 2 provides a breakdown of the vegetation type, slope class and the required APZ for the proposed stages. Dwelling locations on proposed lots have not been chosen at the time of writing this report. Therefore the impact on future dwellings could not be considered in this assessment. The APZs have been calculated for the Shoalhaven Region using a FDI of 100. The distance for the asset protection zone/separation distance has been measured in accordance with Addendum: Appendix 3 (2010) A3.5 (Site assessment methodology for determine level of bushfire attack) which is between each of the vegetation formation identified (from the edge of the foliage cover) and the building. The separation distances have been measured onsite using an OPTi-Logic 1000 LH (Insight) Laser Rangefinder.

Table 2: Breakdown of the vegetation type, slope class and the required APZ in accordance with Table A2.4 (≤29kW/m^2) of Appendix 2 of PBP 2006 for the different stages.

Direction	*Dominate Vegetation Type*	*Effective Bushfire Slope*	*Required APZ (m)*	*APZ Provided (m)*	*Comments*
Stage 1 - Lots 1 to 18 and 25 (Public Reserve)					
North	Reduced vegetation	1 ° downslope	100	100	Lot 1 will be cleared and re-graded as part of the stage 1 civil works. Once developed the area will be residential development, sealed roads, commercial center and public reserve.
East	Reduced vegetation	1 ° downslope	100	100	25m road reserve, and 100m+ of managed grassland. The area to the east of the subject site comprises part of the overall Urban Release Area. Once developed the area will comprise residential lots.
West	Forest	1 ° downslope	25	30	30m of road reserve (George Evans Road), and 100m of forest vegetation. The area to the west of the subject site comprises part of the overall Urban Release Area. Once developed the area will comprise residential lots.

Direction	*Dominate Vegetation Type*	*Effective Bushfire Slope*	*Required APZ (m)*	*APZ Provided (m)*	*Comments*
South	Forest	1 ° downslope	25	30	30m of road reserve (George Evans Road), and 100m forest vegetation.
Stage 2 - Lots 19 to 23, 40 – 45 and 60 - 64					
North	Reduced vegetation	1 ° downslope	100	100	Lot 1 will be cleared and re-graded as part of the stage 1 civil works. Once developed the area will be residential development, and sealed roads.
East	Reduced vegetation	1 ° downslope	100	100	Lot 1 will be cleared and re-graded as part of the stage 1 civil works. Once fully developed the area will be residential development, sealed roads, commercial center and public reserve.
West	Forest	1 ° downslope	25	30	30m of road reserve (George Evans Road), and 100m of forest vegetation. The area to the west of the subject site comprises part of the overall Urban Release Area. Once developed the area will comprise residential lots.
South	Forest	1 ° downslope	25	30	30m of road reserve (George Evans Road), and 100m forest vegetation.
Stage 3 - Lots 26 to 32 and Village Centre (Lot 24)					
North	Forest	1 ° downslope	25	Minimum 25	3m wide APZ easement will be required to be created over proposed lot 97 (Part Lot 458) until stage 8 is developed. 6m within the proposed new lots (building line setback), 16m of road reserve (Road 4), and 45 - 95m forest vegetation within Part 458 (until stages 6, 7 and 8).
East	Reduced vegetation	1 ° downslope	100	100	Lot 1 will be cleared and re-graded as part of the stage 1 civil works. Once fully developed the area

Direction	*Dominate Vegetation Type*	*Effective Bushfire Slope*	*Required APZ (m)*	*APZ Provided (m)*	*Comments*
					will be residential development and sealed roads.
West	Reduced vegetation	Upslope	100	100	Lot 1 will be cleared and re-graded as part of the stage 1 civil works. Once developed the area will be residential development and sealed roads.
South	Reduced vegetation	Upslope	100	100	The site will be developed as part of stage 1 and will comprise residential development, sealed roads, commercial center and public reserve.
Stage 4 - Lots 33 to 39					
North	Forest	1 ° downslope	25	Minimum 48	48m of Lot 1 will be cleared and re-graded as part of the stage 1 civil works. 115m of Part 458 will remain vegetated until stages 6, 7 and 8. Once develop the area will residential development, sealed roads, commercial center and public reserve.
East	Reduced vegetation	1 ° downslope	100	100	20m road reserve, and 100m+ of managed grassland. The area to the east of the subject site comprises part of the overall Urban Release Area. Once developed the area will comprise residential lots.
West	Reduced vegetation	Upslope	100	100	Lot 1 will be cleared and re-graded as part of the stage 1 civil works. The site will be developed as part of stage 3 and will comprise residential development and sealed roads.
South	Reduced vegetation	Upslope	100	100	The site will be developed as part of stages 1 and 2 and will comprise residential development, sealed roads, commercial center and public reserve.

Direction	*Dominate Vegetation Type*	*Effective Bushfire Slope*	*Required APZ (m)*	*APZ Provided (m)*	*Comments*
Stage 5 - Lots 46 to 59					
North	Forest	1 ° downslope	25	25	Within the proposed new lots (building line setback), road reserve (Jonsson Road – variable width), and 100m+ forest vegetation.
East	Forest	1 ° downslope	25	Minimum 25	9m wide APZ easement will be required to be created over proposed lot 97 (Part Lot 458) until stage 8 is developed. 16m of road reserve (Road 1), and 100m forest vegetation within Part 458 (until stages 6, 7 and 8). Once develop the area will residential development, and sealed roads.
West	Forest	1 ° downslope	25	30	30m of road reserve (George Evans Road), and 100m of forest vegetation. The area to the west of the subject site comprises part of the overall Urban Release Area. Once developed the area will comprise residential lots.
South	Reduced vegetation	Upslope	100	100	The site will be developed as part of stage 2 and will comprise residential development and sealed roads.
Stage 6 - Lots 73 to 84					
North	Forest	1 ° downslope	25	25	Within the proposed new lots (building line setback), road reserve (Jonsson Road – variable width), and 100m+ forest vegetation.
East	Reduced vegetation	1 ° downslope	100	100	20m road reserve, and 100m+ of managed grassland and existing dwellings. The area to the east of the subject site comprises part of the overall Urban Release Area. Once developed the area will comprise residential lots.

Direction	*Dominate Vegetation Type*	*Effective Bushfire Slope*	*Required APZ (m)*	*APZ Provided (m)*	*Comments*
West	Forest	Flat	20	20	20m wide APZ easement will be required to be created over proposed lots 65, 85, 86, 109, and 108 (Part Lot 458) until stages 7 and 8 are developed. Once develop the area will residential development and sealed roads.
South	Reduced vegetation	Upslope	100	100	The site will be developed as part of stages 1 and 3 and will contain residential development, sealed roads, commercial center and public reserve.
Stage 7 - Lots 65 – 69 and 101 - 109					
North	Forest	1 ° downslope	25	25	25m wide APZ easement will be required to be created over proposed lots 85- 94 until stage 8 is developed. Once develop the area will residential development and sealed roads.
East	Reduced vegetation	1 ° downslope	100	100	30m of residential lots created during stage 6, 20m road reserve, and 100m+ of managed grassland. The area to the east of the subject site comprises part of the overall Urban Release Area. Once developed the area will comprise residential lots.
West	Forest	Upslope	20	20	20m wide APZ easement will be required to be created over proposed lots 94, 95, 99 and 100 until stage 8 is developed.
South	Reduced vegetation	Upslope	100	100	Lot 1 will be cleared and regarded as part of the stage 1 civil works. The site will be developed as part of stages 1, 3 and 4 and will contain residential development, sealed roads, commercial center and public

Direction	*Dominate Vegetation Type*	*Effective Bushfire Slope*	*Required APZ (m)*	*APZ Provided (m)*	*Comments*
					reserve.
Stage 8 – Lots 85 - 100					
North	Forest	1 ° downslope	25	25	Within the proposed new lots (building line setback), road reserve (Jonsson Road – variable width), and 100m+ forest vegetation.
East	Reduced vegetation	1 ° downslope	100	100	50m of residential lots created during stage 6, 20m road reserve, and 100m+ of managed grassland. The area to the east of the subject site comprise part of the overall Urban Release Area. Once developed the area will comprise residential lots.
West ***(Northwest)***	Forest	1 ° downslope	25	Minimum 45	45m of road reserve (Jonsson Rd or residential lots), and 100m of forest vegetation.
South	Reduced vegetation	Upslope	100	100	The site will be developed as part of stage 1 - 7 and will comprise residential development, sealed roads, commercial center and public reserve.

3.3 ASSESSING THE BUSHFIRE RISK

The main factors directly affecting the behavior of fire are:

- Wind (strength and direction);
- Fuel Moisture and content (how dry it is, relative humidity);
- Type quantity and arrangement of fuel (vegetation density); and
- Slope (fire spreads quicker upslope due to preheating).

The prevailing weather conditions associated with the bushfire season in the Shoalhaven region are strong north-westerly winds, low relative humidity and high temperatures. With the combination of the current vegetation and slope, the overall bushfire risk associated with the proposed development would be medium to high, with the foremost bushfire risk coming from the Scribbly Gum – Blackwood Woodland vegetation contained in the northern section of the site (for stages 3, 4 6 and 7), the Scribbly Gum – Blackwood Woodland vegetation to the west of the site and the Grey Gum – Stringybark Forest/Woodland to the north of the site.

Once the subdivision is fully developed the required assets protection zones will be contained within the public road reserves and the 6m building line setbacks. However, until Part Lot 458

DP1063107 is cleared as part of the civil works associated with stages 6, 7 and 8 interim APZ, easements will be required as outline in Table 3 and shown in **Attachment 4**.

Table 3: APZ requirements

Direction	APZ Requirement	Compliance
Stage 1		
West	25m	Contained within road reserve (George Evans Road).
South	25m	Contained within the road reserve (George Evans Road)
Stage 2		
West	25m	Contained within the road reserve (George Evans Road).
South	25m	Contained within the road reserve (George Evans Road).
Stage 3		
North	25m	Contained within the: • 6m within the proposed new lots (building line setback); • 16m of road reserve (Road 4); and • 3m wide APZ easement will be required to be created over proposed lot 97 (Part Lot 458) until stage 8 is developed.
Stage 4		
North	25m	Contained within the area cleared and re-graded as part of the stage 1 civil works.
Stage 5		
North	25m	Contained within the: • the proposed new lots (building line setback); and • road reserve (Jonsson Road – variable width).
East	25m	Contained within the: • 16m of road reserve (Road 1); and • 9m wide APZ easement will be required to be created over proposed lot 97 (Part Lot 458) until stage 8 is developed.
West	25m	Contained within the road reserve (George Evans Road).

Stage 6		
North	25m	Contained within the: • the proposed new lots (building line setback); and • road reserve (Jonsson Road – variable width).
West	20m	20m wide APZ easement will be required to be created over proposed lots 65, 85, 86, 109, and 108 (Part Lot 458) until stages 7 and 8 are developed.
Stage 7		
North	25m	25m wide APZ easement will be required to be created over proposed lots 85- 94 until stage 8 is developed.
West	20m	20m wide APZ easement will be required to be created over proposed lots 94, 95, 99 and 100 until stage 8 is developed.
Stage 8		
North	25m	Contained within the: • the proposed new lots (building line setback); and • road reserve (Jonsson Road – variable width).
West (northwest)	25m	Contained within the: • the proposed new lots (building line setback); and • road reserve (Jonsson Road – variable width).

PBP 2006 allows APZ easements to be created on an adjoining land under exceptional circumstances. PBP states that an example of an exceptional circumstance is:

"Where it can be demonstrated that there is a strong likelihood of the adjoining land being developed for future residential or other compatible purposes (eg staged development or Urban Development Program or Strategies with supporting development control plans)".

The proposed easements will be over land that is to be developed as part the same development approval and as such satisfies the provisions of exceptional circumstances.

The APZs should be maintained as Inner Protection Zones (Figure 6) and comply with the following:

- Existing larger trees (at least 150mm in diameter measured at chest height) may remain within the APZ provided that:

  - They do not occur within 4m of a building;
  - Lower limbs are removed;
  - Shrubs beneath the trees are removed; and
  - Crowns do not form a continuous canopy.
- Smaller trees, shrubs, fallen trees, tree limbs and stumps are to be removed
- The presence of a few shrubs is acceptable provided that they are at least 10m from the structure, are well spread out, do not form a contiguous pathway to the dwelling and do not constitute more than 5% of the total APZ area.
- Vegetable gardens or fruit trees may be located within the APZ. Any other gardens should not occupy more that 5% of the APZ and only contain low flammability species.
- A minimal ground fuel is to be maintained to include either mowed grass, paving, concrete, bare ground or less that 4 tonnes per hectare of fine fuel.
- Any structures within the APZ are to be non-combustible
- Any structures storing combustible materials such as firewood must be sealed to prevent entry of burning debris.
- Gutters, roofs and roof gullies shall be kept free of leaves and other debris.

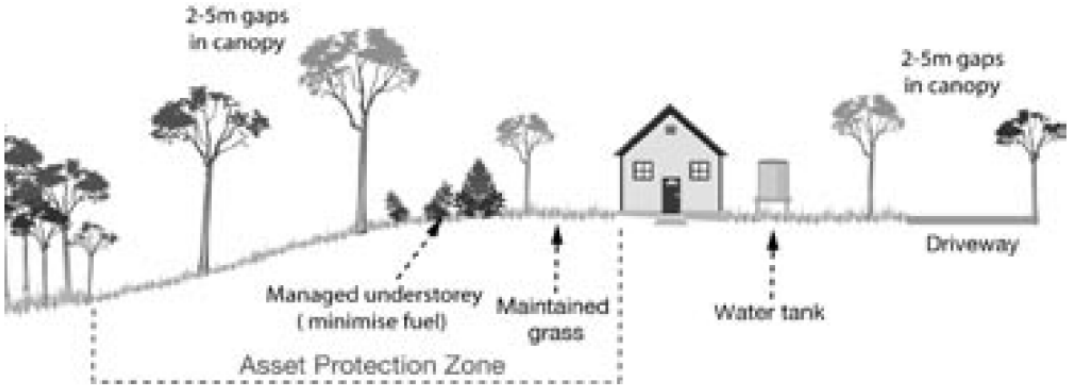

Figure 6: Diagrammatic representation of an Asset Protection Zone.

The location of the dwellings on the proposed lots had not been chosen at the time of writing this report. However, all lots will be able to achieve a building envelope which compiles the APZ requirements outline in Appendix 2 of PBP 2006.

3.4 CONSTRUCTION STANDARDS

The construction standards and associated performance criteria for infill development require that the proposed building can withstand bushfire attack in the form of wind, smoke, embers, radiant heat and flame contact. The Addendum to Appendix 3 of PBP 2006 (2010) requires that the construction standards be determined in accordance with AS3959 - 2009.

AS3959 - 2009 states that the construction requirements for the next lower BAL than that determined for the site may be applied to an elevation of the building where the elevation is not exposed to the source of bushfire attack. An elevation is deemed to be not exposed to the source of bushfire attack if all of the straight lines between that elevation and the source of bushfire attack are obstructed by another part of the building. The construction requirements for a shielded

elevation shall be not less than that required for BAL—12.5, except where the exposed elevations have been determined as BAL—LOW.

Recommendation

The Bushfire Attack Level and associated construction requirements for the future dwellings on the proposed lots will depend upon their final position and will therefore be determined at the time of a development application for the future dwellings. However, all dwellings will have a bushfire exposure level equivalent to BAL 40 or lower in accordance with AS3959-2009.

3.5 SITING AND ADEQUACY OF WATER ELECTRICITY AND GAS SUPPLIES

The performance criteria and acceptable solutions for water, electricity and gas for residential subdivisions in accordance with PBP 2006 are provided in Table 4. The intent of the measures are to provide adequate water services for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building.

Table 4: Provides the performance criteria and acceptable solutions for water, electricity and gas for residential in accordance with PBP 2006.

Performance Criteria	Acceptable Solutions	Compliance
Reticulated water supplies Water supplies are easily accessible and located at regular intervals	• reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads. • fire hydrant spacing, sizing and pressures comply with AS 2419.1 – 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. • hydrants are not located within any road carriageway. • all above ground water and gas service pipes external to the building are metal, including and up to any taps. • the provisions of parking on public roads are met.	The development will be connected to the local reticulated town water supply. The size and pressure of the town water supply main servicing the subject development site has not been determined as part of this report. Fire hydrant will be positioned within the road reserves of the proposed local road network (Attachment 5) to satisfy the requirements set out in AS 2419.1 – 2005. All portions of the future dwellings will be within reach of a 10 m hose stream, issued from a nozzle at the end of a 60 m length of hose laid on the ground from a pumping appliance which is connected to feed fire hydrant by a 20m hose (Refer to Figure 6).
Electricity Services • Location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings • Regular inspection of lines is undertaken to ensure they	• where practicable, electrical transmission lines are underground. • where overhead electrical transmission lines are proposed: - lines are installed with short pole spacing (30 metres) unless crossing gullies, gorges or riparian areas; and - no part of a tree is closer to a power line than the distance set out in accordance with the specifications in	Electricity services are provided to local area. The electricity service is suitable to be augmented via underground transmission lines to the future dwellings. Augmentation is to comply with the acceptable solution outlined in this table.

Performance Criteria	Acceptable Solutions	Compliance
are not fouled by branches.	'Vegetation Safety Clearances' issued by Energy Australia (NS179, April 2002).	From the site inspection there is no reason why the installation of the electricity services cannot comply with the acceptable solution outlined in this table.
Gas services Location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings	• reticulated or bottled gas is installed and maintained in accordance with AS 1596 and the requirements of relevant authorities. Metal piping is to be used. • all fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and shielded on the hazard side of the installation. • if gas cylinders need to be kept close to the building, the release valves are directed away from the building and at least 2 metres away from any combustible material, so that they do not act as a catalyst to combustion. • Connections to and from gas cylinders are metal. • polymer sheathed flexible gas supply lines to gas metres adjacent to buildings are not used.	Reticulated piped gas is not available to the subject site. Any future gas bottles shall be installed and maintained in accordance with AS 1596. Gas cylinders are to be positioned in accordance with the acceptable solution outlined in this table. From the site inspection there is no reason why the installation of gas cylinders for the future dwellings cannot comply with the acceptable solution outlined in this table.

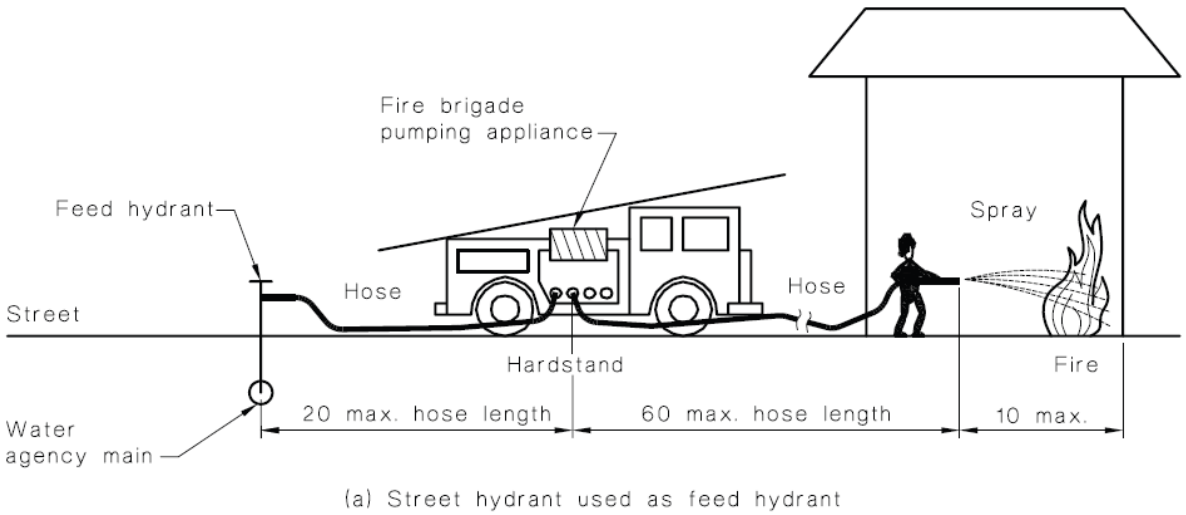

Figure 7: Street hydrant requirements in accordance with AS 2419.1 – 2005.

3.6 CAPACITY OF THE PUBLIC ROADS TO HANDLE INCREASED VOLUME OF TRAFFIC IN THE EVENT OF AN EMERGENCY

The intent of the measures are to provide safe operational access to structures and water supply for emergency services, while residents are seeking to evacuate from an area.

The proposed subdivision will be accessed via George Evans Road, Jonsson Road and the unformed Crown Road, which are all to be ungraded as the part of the proposal. Access to the proposed lots will be off the new connecting roads (Road 1, 2, 3, 4, 5 and 6). A roundabout will be provided at the entrance to the development.

The extension and upgrade of George Evans Road, Jonsson Road and the unformed Crown Road (spine road) will be designed to match the carriageway of the existing roads leading up to the site. The new section of road along the unformed Crown Road is proposed to have a 25m road reserve up to the Village centre, with remainder of the spine, George Evans Road and Jonsson Road having a 20m reserve. These road widths will provide for easy vehicle manoeuvrability and safe access in and out of the proposed internal circulation roads throughout the subdivision.

The new internal circulation roads are proposed to have a road reserve width of 16m and designed in accordance with the principles in Council's Subdivision Code (DCP 100). Internal roads will be designed to accommodate the swept paths of garbage trucks and furniture delivery vans. The main internal road network will also accommodate buses.

The performance criteria and acceptable solutions for Public Roads for residential subdivisions in accordance with PBP 2006 are provided in Table 5.

Table 5: Provides the performance criteria and acceptable solutions for Public Roads for residential in accordance with PBP 2006.

<table>
<tr><th>Performance Criteria</th><th>Acceptable Solutions</th><th>Compliance</th></tr>
<tr><td>Firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources)</td><td>Public roads are two-wheel drive, all weather roads.</td><td>All the roads servicing the proposed lots will be sealed public roads.</td></tr>
<tr><td>Public road widths and design that allow safe access for firefighters while residents are evacuating an area.</td><td>• urban perimetre roads are two-way, that is, at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions. Non perimetre roads comply with Road widths for Category 1 Tanker (medium Rigid Vehicle):
<table>
<tr><th>Curve radius (inside edge (m))</th><th>Swept Path (Width (m))</th><th>Single lane (Width (m))</th><th>Two way (Width (m))</th></tr>
<tr><td><40</td><td>3.5</td><td>4.5</td><td>8.0</td></tr>
<tr><td>40-69</td><td>3.0</td><td>3.9</td><td>7.5</td></tr>
<tr><td>70-100</td><td>2.7</td><td>3.6</td><td>6.9</td></tr>
<tr><td>>100</td><td>2.5</td><td>3.5</td><td>6.5</td></tr>
</table></td><td>George Evans Road and Jonsson Road are urban perimetre roads and will have a carriageway 8 metre kerb to kerb. Internal roads (Road 1, 2, 3, 4, 5 and 6) will have a carriageway 6 metres kerb to kerb.

The perimetre roads are linked to the internal road system at an interval of no greater than 500 metres.

All the proposed roads shall be designed and constructed to comply with the acceptable solution provided in this table.

There is one dead end road proposed</td></tr>
</table>

Performance Criteria	Acceptable Solutions	Compliance
	• the perimetre road is linked to the internal road system at an interval of no greater than 500 metres in urban areas. • traffic management devices are constructed to facilitate access by emergency services vehicles. • public roads have a cross fall not exceeding 3 degrees. • all roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends 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 and direct traffic away from the hazard. • curves of roads (other than perimetre roads) are a minimum inner radius of six metres and minimal in number, to allow for rapid access and egress. • the minimum distance between inner and outer curves is six metres. • 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. • there is a minimum vertical clearance to a height of four metres above the road at all times.	(Road 5). This road is less than 200m long (140m) and provides a turning area equivalent to that required by the acceptable solutions. The proposed public road widths and design will allow for safe access for firefighters while residents are evacuating an area.
The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles.	The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas). Bridges clearly indicate load rating.	All roads shall be designed and constructed to Shoalhaven City Council requirements and comply with the acceptable solution.
Roads that are clearly sign-posted (with easily distinguishable names) and buildings/properties that are clearly numbered.	• public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression. • public roads between 6.5 metres and 8 metres wide are No Parking on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression.	There are no parking bays proposed within George Evans Road and Jonsson Road. All hydrants will be within the road reserve.

Performance Criteria	Acceptable Solutions	Compliance
There is clear access to reticulated water supply.	• public roads up to 6.5 metres wide provide parking within parking bays and locate services outside the parking bays to ensure accessibility to reticulated water for fire suppression. • one way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.	Internal roads (Road 1, 2, 3, 4, 5 and 6) will have a carriageway 6 metre kerb to kerb. Fire hydrants shall be positioned outside of any parking bays. Parking bays shall be positioned to ensure clear access to reticulated water for fire suppression is available.
Parking does not obstruct the minimum paved width.	• parking bays are a minimum of 2.6 metres wide from kerb edge to road pavement. No services or hydrants are located within the parking bays. • public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road.	Parking bays shall be designed to have a minimum of 2.6 metres wide from kerb edge to road pavement. No services or hydrants are to be located within the parking bays. George Evans Road and Jonsson Road Shall be designed and constructed with roll top kerbing to the hazard side of the road.

3.7 ADEQUACY OF ACCESS AND EGRESS FROM SITE FOR EMERGENCY REPONSES

The intent of measures is to provide safe access to/from the public road system for firefighters providing property protection during a bush fire and for occupants faced with evacuation. PBP states (as the acceptable solution for normal property access);

"No specific access requirements apply in an urban area where a 70 metres unobstructed path can be demonstrated 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 fire fighting vehicles (i.e. a hydrant or water supply)".

All the proposed lots are capable of supporting dwellings which have a 70 metre unobstructed path between the most distant external part of the dwelling and the nearest part of the public access road. The public access roads are supported by a reticulated water supply system. The fire hydrant within public access roads satisfies the requirements set out in AS 2419.1 – 2005.

Access and egress from the site is considered adequate.

3.8 ADEQUACY OF BUSHFIRE MAINTENANCE PLANS FOR EMERGENCY

Shoalhaven Rural Fire District (92 Albatross Rd, PO Box 372 Nowra) currently administers bushfire maintenance plans and fire emergency procedures in this particular area.

Considering the nature of the subject development and potential occupancy, should a bushfire emergency impact upon this area, the implementation of the existing Shoalhaven Sect. 52 Operations & Risk Plan should be adequate for emergency procedures associated with a bushfire event. Therefore in the author's opinion a site specific Bush Fire Emergency Management Plan and Bushfire Maintenance Plan is not required.

Legislation requires occupants of land to immediately extinguish fires or notify fire-fighting authorities, on becoming aware of fire during fire danger period. The most appropriate course of action is to telephone "000" and report the fire.

3.9 LANDSCAPING

The performance criteria is for landscaping to be designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind driven embers to cause ignitions. PBP 2006 states that "*the principles of landscaping for bushfire protection aim to:*

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

It is recommended that any future landscaping on the proposed lots be designed and maintained in accordance with the following practices:

- maintaining a clear area of low cut lawn or pavement adjacent to the house;
- keeping areas under fences, fence posts and gates and trees raked and cleared of fuel;
- utilising non-combustible fencing and retaining walls;
- breaking up the canopy of trees and shrubs with defined garden beds;
- organic mulch should not be used in bushfire prone areas and non-flammable material should be used as ground cover, eg Scoria, pebbles, recycled crushed bricks.
- planting trees and shrubs such that:
    - the branches will not overhang the roof; and
    - the tree canopy is not continuous.

3.10 PBP 2006 SPECIFIC OBJECTIVE ASSESSMENT

All development on Bushfire Prone Land must satisfy the aim and objectives of PBP 2006. Table 6 demonstrates who the proposal complies with the specific objectives of PBP 2006.

Table 6: Compliance with the specific objectives of PBP 2006.

PBP 2006 Specific Objective	Assessment / Comment
Afford occupants of any building adequate protection from exposure to a bushfire.	Where the recommendations stated by this report are reasonably and adequately incorporated (where practicable), occupants remaining within the subject development site during a significant bushfire event would be afforded the benefit bushfire protection 'measures in combination'. In this respect, fire fighters or occupants remaining within the subject development site or else defending an asset or building during a passing bushfire event should reasonably be better afforded an acceptable level of protection.
Provide for a defendable space to be located around buildings.	Where the recommendation relating to APZ management as stated by this report is reasonably and adequately incorporated, all building structures would be afforded a reasonable area of defendable space (complying APZ) within the subject development site.
Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition.	Where the recommendations relating to construction standards & APZ area stated by this report are reasonably and adequately incorporated all buildings would reasonably be able to avoid direct flame contact and material ignition.
Ensure that safe operational access and egress for emergency service personnel and residents is available.	Where the recommendation relating to the public road installation and maintenance as stated by this report is reasonably and adequately incorporated, both emergency services personnel and occupants should be afforded safe access / egress within the subject development site for firefighting or evacuation purposes.
Provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the asset protection zone (APZ).	Where the recommendations relating to construction standards and APZ area stated by this report are reasonably and adequately incorporated, it would be reasonable to assume that regular maintenance works within the subject development would ensure ongoing management and maintenance of bush fire protection measures. Should the standard or upkeep of APZ areas, vegetation maintenance or vehicle access (required for bushfire safety compliance) become compromised during the life of the subject development site, it would also be reasonable to assume such matters would be addressed by the Council or local Fire Authorities through their hazard mitigation policies and notifications.
Ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bushfire fighting).	The recommended water supply facilities within the subject development site are considered adequate for the purposes of bushfire fighting.

	Similarly, where the installation or connection to electrical and gas services incorporates the recommendations as stated by this report, both emergency services personnel or occupants assisting in bush fire fighting should safely be able to manage potential electrical and gas hazards associated during a bushfire event.
Provide for safe emergency evacuation procedures (SFPP Development)	Considering the nature of the subject development and potential occupancy, should a bushfire emergency impact upon this area, the implementation of the existing Shoalhaven Sect. 52 Operations & Risk Plan should be adequate for emergency procedures associated with a bushfire event. Therefore in the author's opinion a site specific Bush Fire Emergency Management Plan and Bushfire Maintenance Plan is not required.

4 CONCLUSION AND RECOMMENDATIONS

The proposal seeks approval under Part 3A of the Environmental Planning and Assessment Act 1979 to construct a 109 lot subdivision of the subject land (Attachment 1). The subdivision comprise a village centre, public open spaces and a mixture of residential lots ranging in size and densities to provide for a range of housing types. All the proposed residential lots will be Torrens Title lots and the proposed subdivision will be constructed and released in eight (8) stages. The timing for the release of the each stage will depend upon market conditions and financing. The proposed subdivision will be accessed via George Evans Road, Jonsson Road and the unformed Crown Road, which are all to be ungraded as the part of the proposal. Access to the proposed lots will be off the new connecting roads (Road 1, 2, 3, 4, 5 and 6). George Evans Road and Jonsson Road are urban perimetre roads and will have a carriageway 8 metre kerb to kerb. Internal roads (Road 1, 2, 3, 4, 5 and 6) will have a carriageway 6 metre kerb to kerb.

With the combination of the current vegetation and slope, the overall bushfire risk associated with the proposed development would be medium to high, with the foremost bushfire risk coming from the Scribbly Gum – Blackwood Woodland vegetation contained in the northern section of the site (for stages 3, 4 6 and 7), the Scribbly Gum – Blackwood Woodland vegetation to the west of the site and the Grey Gum – Stringybark Forest/Woodland to the north of the site.

Perimeter roads have been utilised in the subdivision design to reduce the APZ requirements on individual lots and improve access for fire fighting purposes. Fire hydrants will be provided throughout the development, observing an unobstructed 70m path between the hydrant and the furthest point of any building (**Attachment 5**). Once the subdivision is fully developed the required assets protection zones to comply with Appendix 2 (≤29kW/m^2) of PBP 2006 will be contained within the public road reserves of George Evans and Jonsson Roads and the 6m building line setbacks of the lots that are adjacent to those roads. However, until Part Lot 458 DP1063107 is cleared as part of the civil works associated with stages 6, 7 and 8 interim APZ easements will be required as outline in Table 3 and shown in Attachment 4. PBP 2006 allows APZ easements to be created on an adjoining land under exceptional circumstances. The proposed easements are over land that will be developed as part the same development approval and as such satisfies the provisions of exceptional circumstances contained within PBP 2006.

The location of the dwellings on the proposed lots had not been chosen at the time of writing this report. However, all lots will be able to achieve a building envelope which compiles the APZ requirements outline in Appendix 2 of PBP 2006. The Bushfire Attack Level and associated construction requirements for the future dwellings on the proposed lots will depend upon their final position and will therefore be determined at the time of a development application for the future dwellings. However, all dwellings will have a bushfire exposure level equivalent to BAL 40 or lower in accordance with AS3959-2009.

The following recommendations are made to improve the bushfire protection afforded the proposed subdivision and provides guidance on the position and design of any future dwelling on the proposed lots:

- A Bushfire Risk Assessment shall are prepared at the time of the development application for the future dwelling on proposed lot located within 100m of bushfire threat to determine the appropriate construction requirements.
- The following APZs should be maintained as Inner Protection Zones:
    - Stage 1 - 25m in a westerly and southerly direction;
    - Stage 2 - 25m in a westerly and southerly direction;
    - Stage 3 - 25m in a northerly direction;
    - Stage 4 - 25m in a northerly direction;
    - Stage 5 - 25m in a northerly, easterly and westerly direction;
    - Stage 6 - 25m in a northerly direction and 20m in a westerly direction;
    - Stage 7 - 25m in a northerly direction and 20m in a westerly direction; and
    - Stage 8 - 25m in a northerly direction and 20m in a northwesterly direction.
- The lots are to be landscaped and maintained in accordance with the following practices:
    - maintaining a clear area of low cut lawn or pavement adjacent to the house;
    - keeping areas under fences, fence posts and gates and trees raked and cleared of fuel;
    - utilising non-combustible fencing and retaining walls;
    - breaking up the canopy of trees and shrubs with defined garden beds;
    - organic mulch should not be used in bushfire prone areas and non-flammable material should be used as ground cover, eg Scoria, pebbles, recycled crushed bricks.
    - planting trees and shrubs such that:
        - the branches will not overhang the roof; and
        - the tree canopy is not continuous.
- The development shall be connected to the local reticulated town water supply. Fire hydrant shall be positioned within the road reserves of the proposed local road network to satisfy the requirements set out in AS 2419.1 – 2005.
- The electricity service shall be augmented via underground transmission lines to the future dwellings.
- Any future gas bottles shall be installed and maintained in accordance with AS 1596. Gas cylinder relief valves shall be directed away from the building and away from any hazardous materials such as firewood, etc.
- All roads shall be designed and constructed to Shoalhaven City Council requirements and complies with the following requirements:
    - Roads shall have a cross fall not exceeding 3 degrees.

- Road 5 shall a minimum 12 metres outer radius turning circle or equivalent and shall be clearly sign posted as a dead end.
- Curves of roads (other than perimetre roads) are a minimum inner radius of six metres.
- The minimum distance between inner and outer curves is six metres.
- 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.
- There is a minimum vertical clearance to a height of four metres above the road at all times.
- Parking bays shall be positioned to ensure clear access to reticulated water for fire suppression is available. Parking bays shall be designed to have a minimum of 2.6 metres wide from kerb edge to road pavement.
- No services or hydrants are to be located within the parking bays.
- George Evans Road and Jonsson Road shall be designed and constructed with roll top kerbing to the hazard side of the road.

If the proposed 109 lot subdivision of Lot 1 DP 568678 DP 1021332 & Part Lot 458 DP 1063107 is undertaken in accordance with the recommendations outlined in this report it will comply with performance requirements provided in *Planning for Bushfire Protection* (2006) and will provided adequate provision for fire fighting strategies. Compliance with the overall performance requirements of Clause 44 of the Rural Fires Regulation 2008 is provided in Table 7.

Table 7: Compliance with the performance requirements of Clause 44 of the Rural Fires Regulation 2008.

Bushfire Protection Measure	Compliance
Asset Protection Zones	YES - Refer to Sections 3.2, 3.3 and Attachment 5.
The siting and adequacy of water supplies for fire fighting	YES - Refer to Sections 3.5 and Attachment 4.
Capacity of public roads to handle increased volumes of traffic in the event of a bushfire emergency	YES – Refer to Sections 3.6.
Whether or not public roads in the vicinity that link with the fire trail network have two-way access	Not applicable.
Adequacy of emergency response access and egress	YES - Refer to Sections 3.7.
Adequacy of bushfire maintenance plans and fire emergency procedures	YES - Refer to Sections 3.8.
Building construction standards	YES - Refer to Sections 3.4.
Adequacy of sprinkler systems and other fire protection measures to be incorporated into the development	Not applicable.

This Bushfire Risk Assessment should remain current for a period of five years (2017), at which time it should be subject to review to take account changing land use and vegetation patterns. Any major bushfire event that affects the subject site should also trigger a review in order to determine the effectiveness of protection measures and annual hazard reduction activities.

The findings contained within this report are the result of discrete/specific methodologies used in accordance with recognised practices. To the best of our knowledge they represent a reasonable interpretation of the general conditions of the site. However, having stated this, it is important to note that although designing houses to have an improved level of fire resistance will increase the

likelihood of their survival in a bushfire, their survival and that of the occupants cannot be guaranteed and therefore the decision as to whether to *stay* or *go* should be based on an understanding that the adoption of solutions outlined in this report will not guarantee safety.

ATTACHMENT 1

SKETCH PLAN OF PROPOSED SUBDIVISION

LEGEND

- PROPOSED PUBLIC OPEN SPACE
- MEDIUM DENSITY LOT 5
- VILLAGE CENTRE
- DUAL OCCUPANCY
- RESIDENTIAL LOTS

LOT 1 DP 1021332 & LOT 458 DP 1063107	NUMBER OF LOTS	AREA
RESIDENTIAL	94	56021m²
PUBLIC OPEN SPACE	3	10035m²
DUAL OCCUPANCY	5	4487m²
MEDIUM DENSITY	6	20155m²
VILLAGE CENTRE	1	7540m²
ROADS		24442m²
TOTAL		123190m²

LOT 473
DP 1102909

LOT 6
DP 1156684

LOT 4
DP 1156684

6
DP 1156684

LOT 384
DP 755952

EVANS ROAD

GEORGE ROAD

JONSSON ROAD

ROAD 1 (16m WIDE)

ROAD 2 (18m WIDE)

ROAD 3 (18m WIDE)

ROAD 4 (16m WIDE)

ROAD 5 (16m WIDE)

ROAD 6 (16m WIDE)

LANE 1 (7m WIDE)

OSD BASIN & WETLAND (RETENTION BASIN) 25 8644m²

NOTE: RETENTION BASIN TO BE 20m WIDE MINIMUM (AREA TO BE DETERMINED)

PEDESTRIAN ACCESS & OVERLAND FLOW PATH

PROPOSED ROAD WIDENEING

UNFORMED

PART CROWN ROAD TO BE CLOSED

CROWN

OSD/RETENTION BASIN

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		CHECKED AR	D – STAGING ADDED	AR	30/11/12
			F – FINAL PLAN	AR	05/12/12
		APPROV'D	G – ROADS WIDENED	AR	09/04/13
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SKETCH PLAN SHOWING PROPOSED LOT LAYOUT OVER LOT 1 DP 1021332 & PART LOT 458 DP 1063107 GEORGE EVANS ROAD, MUNDAMIA FOR: SHOALHAVEN CITY COUNCIL

A1 SHEET 1 OF 2 SHEETS	REF. No. 102166	PLAN No. 12/98

ATTACHMENT 2

STAGING PLAN

LEGEND

- PROPOSED PUBLIC OPEN SPACE
- MEDIUM DENSITY LOT 5
- VILLAGE CENTRE
- DUAL OCCUPANCY
- RESIDENTIAL LOTS

- STAGE 1
- STAGE 2
- STAGE 3
- STAGE 4
- STAGE 5
- STAGE 6
- STAGE 7
- STAGE 8

LOT 1 DP 1021332 &
LOT 458 DP 1063107

	NUMBER OF LOTS	AREA
RESIDENTIAL	94	56021m²
PUBLIC OPEN SPACE	3	10035m²
DUAL OCCUPANCY	5	4487m²
MEDIUM DENSITY	6	20155m²
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TOTAL		123190m²

LOT 473
DP 1102909

LOT 6
DP 1156684

LOT 4
DP 1156684

6
DP 1156684

LOT 384
DP 755952

EVANS ROAD
GEORGE ROAD
JONSSON ROAD
ROAD 1
ROAD 2
ROAD 3
ROAD 4
ROAD 5
ROAD 6
LANE 1 (7m WIDE)
(16m WIDE)
(18m WIDE)

OSD BASIN & WETLAND (RETENTION BASIN)
OSD/RETENTION BASIN

NOTE: RETENTION BASIN TO BE 20m WIDE MINIMUM (AREA TO BE DETERMINED)

PEDESTRIAN ACCESS & OVERLAND FLOW PATH

PROPOSED ROAD WIDENEING

PART CROWN ROAD TO BE CLOSED

UNFORMED

CROWN

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SKETCH PLAN SHOWING STAGING PLAN
OVER LOT 1 DP 1021332 & PART LOT 458 DP 1063107
GEORGE EVANS ROAD, MUNDAMIA
FOR: SHOALHAVEN CITY COUNCIL

A1 SHEET	2	OF	2 SHEETS
REF. No. 102166			PLAN No. 12/98

ATTACHMENT 3

PHOTOMONTAGE

ATTACHMENT 2 - SITE PHOTOGRAPHS OF LOT 1 DP 568678 & PART LOT 458 DP 1063107 GEORGE EVANS ROAD, MUNDAMIA

Figure 1: Vegetation on the slopes of the southern side of the lot.

Figure 2: View from the centre of the lot looking north (approx. 2m below the surrounding lots).

Figure 3: View of the ground surface at the centre of the lot (approx. 2m below the surrounding lots).

Figure 4: View from the centre of the lot looking north (approx. 2m below the surrounding lots).

Figure 5: View from the southern end of the lot looking west.

Figure 6: Southern end of the lot on George Evans Road.

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Job No: 102166

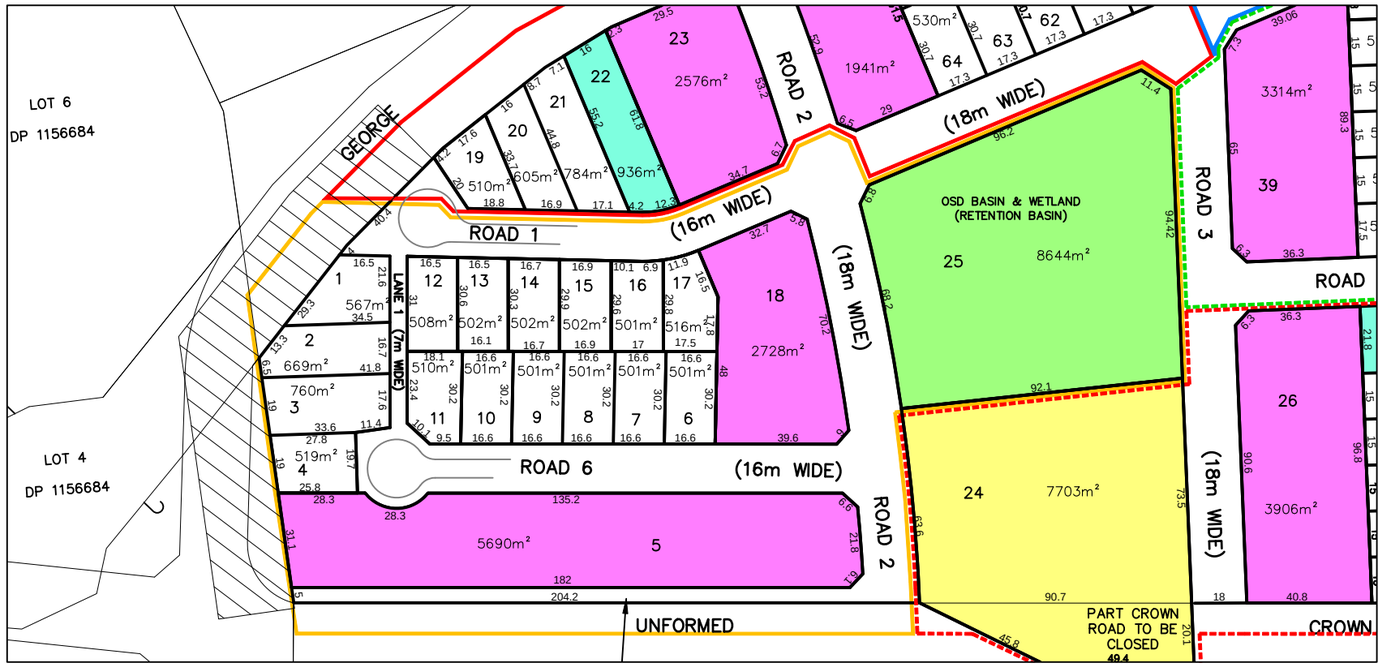
ATTACHMENT 4

SKETCH PLAN SHOWING BUSHFIRE APZ REQUIREMENTS

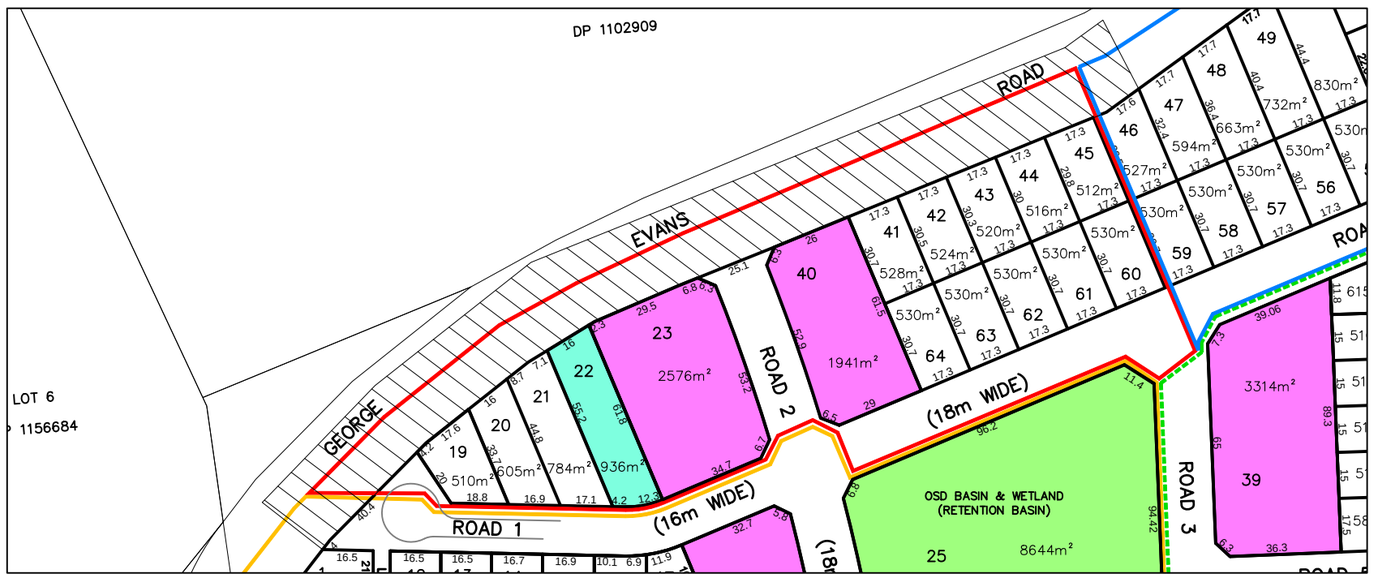
LEGEND

- PROPOSED PUBLIC OPEN SPACE
- MEDIUM DENSITY LOT 5
- VILLAGE CENTRE
- DUAL OCCUPANCY
- RESIDENTIAL LOTS

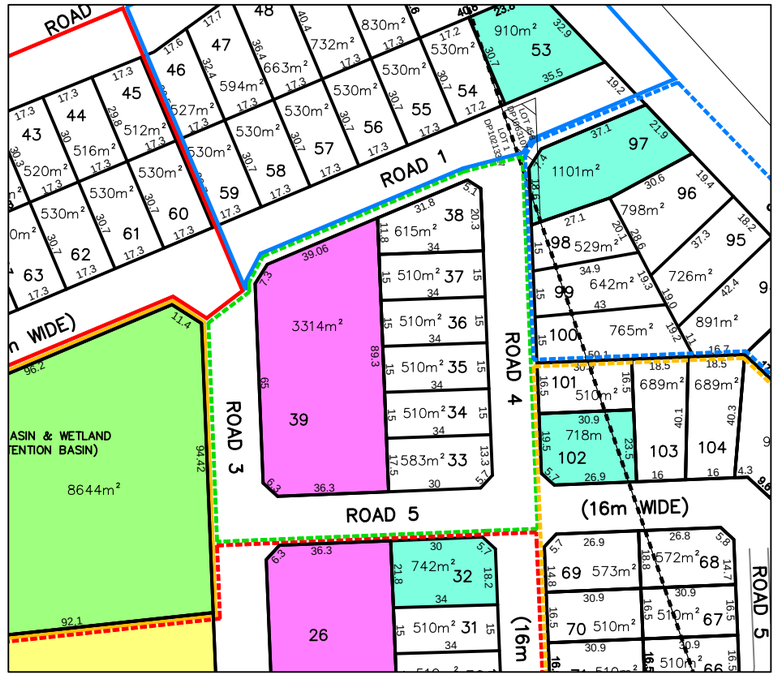
- STAGE 1
- STAGE 2
- STAGE 3
- STAGE 4
- STAGE 5
- STAGE 6
- STAGE 7
- STAGE 8



STAGE 1 APZ REQUIREMENTS

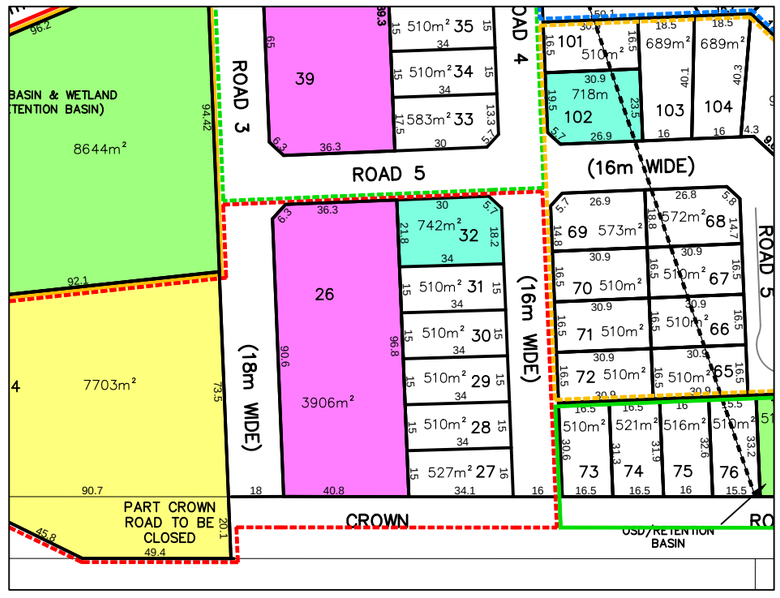


STAGE 2 APZ REQUIREMENTS



STAGE 3 APZ REQUIREMENTS

TEMPORARY VARIABLE WIDTH EASMENT REQUIRED OVER PART OF STAGE 8 (LOT 97 ONLY)



STAGE 4 APZ REQUIREMENTS

NO EASEMENTS REQUIRED

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DATUM	AHD

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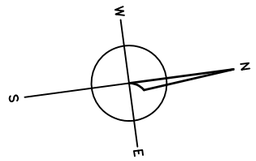
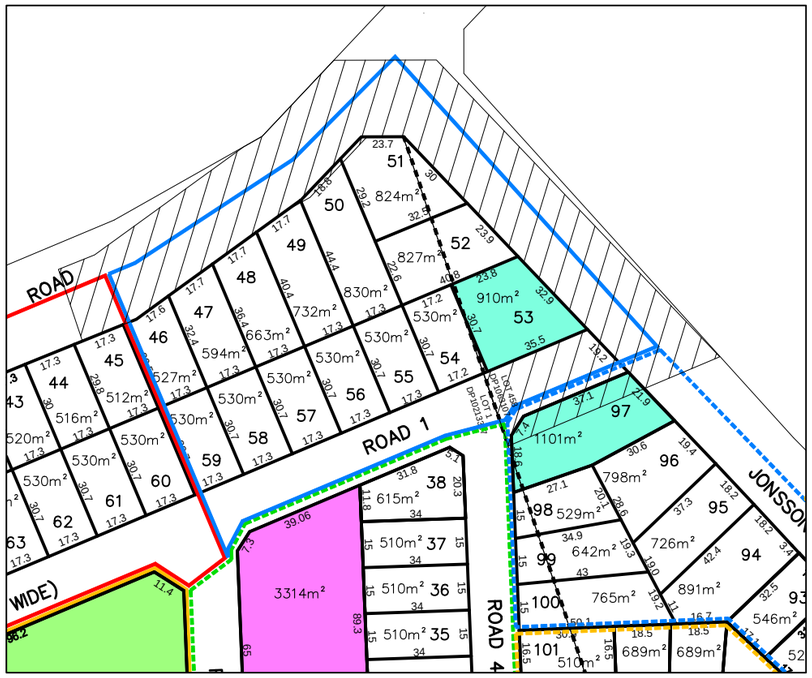
SKETCH PLAN SHOWING BUSHFIRE APZ REQUIREMENTS OVER LOT 1 DP 1021332 & PART LOT 458 DP 1063107 GEORGE EVANS ROAD, MUNDAMIA FOR: SHOALHAVEN CITY COUNCIL

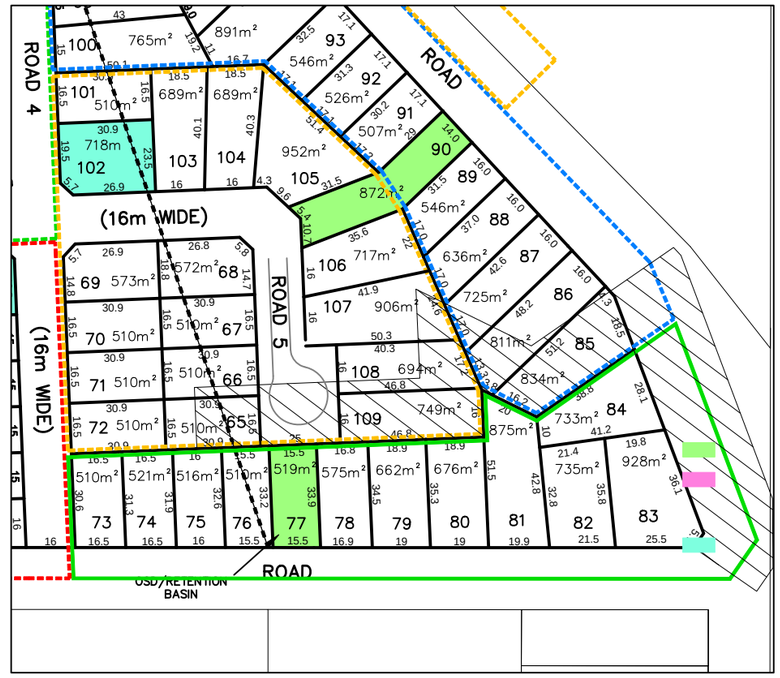
A1 SHEET	1	OF	3 SHEETS
REF. No. 102166			PLAN No. 12/113





STAGE 5 APZ REQUIREMENTS

TEMPORARY 9m EASEMENT REQUIRED OVER STAGE 8 (LOT 97 ONLY)

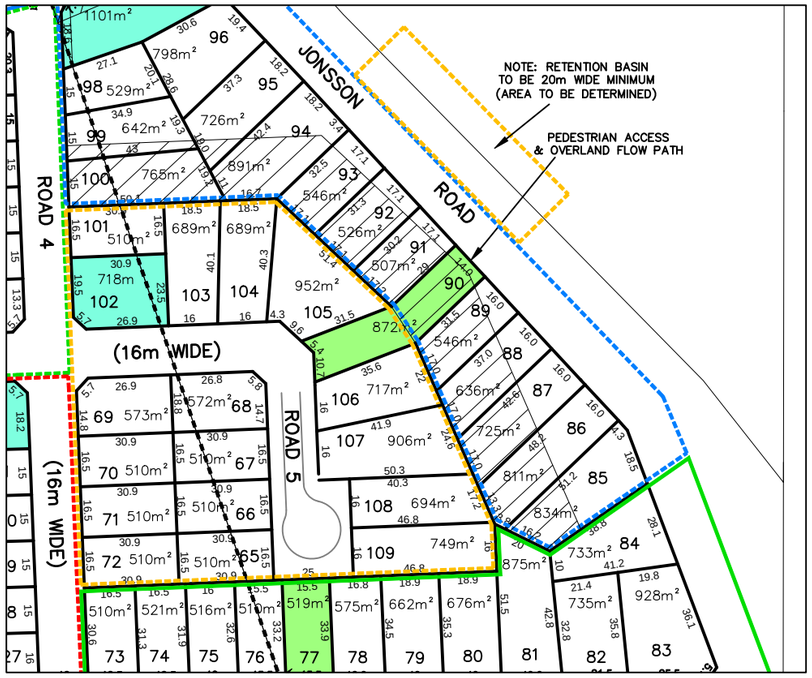


STAGE 6 APZ REQUIREMENTS

TEMPORARY 20m EASEMENT REQUIRED OVER STAGE 7 & STAGE 8

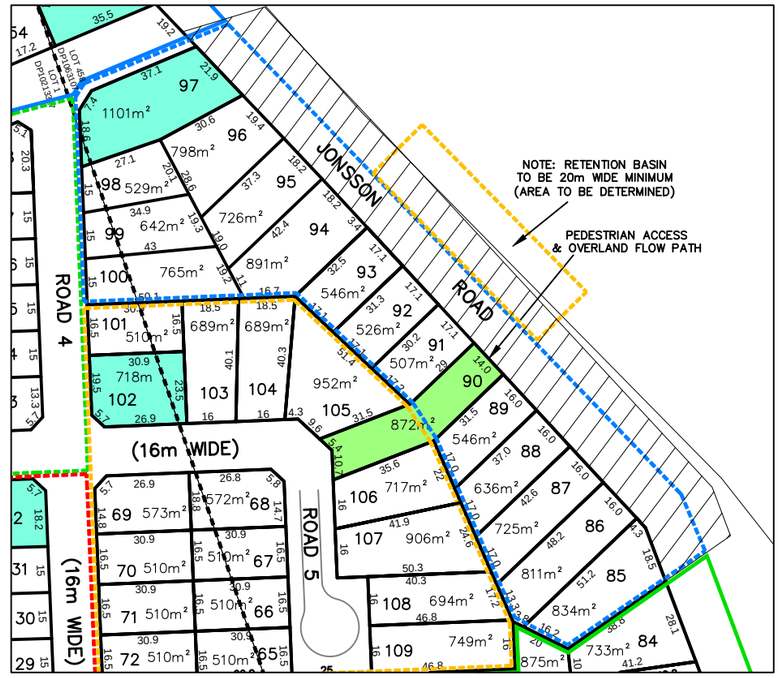
LEGEND

- PROPOSED PUBLIC OPEN SPACE
- MEDIUM DENSITY LOT 5
- VILLAGE CENTRE
- DUAL OCCUPANCY
- RESIDENTIAL LOTS
- STAGE 1
- STAGE 2
- STAGE 3
- STAGE 4
- STAGE 5
- STAGE 6
- STAGE 7
- STAGE 8



STAGE 7 APZ REQUIREMENTS

TEMPORARY EASEMENT REQUIRED OVER STAGE 8



STAGE 5 APZ REQUIREMENTS

NO EASEMENTS REQUIRED

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DATUM AHD	DESIGN AR	O – ORIGINAL ISSUE	AR	25/10/12			REF. No. 102166
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	APPROV'D	C – EASEMENTS ADDED	AR	28/11/12			
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		F – FINAL PLAN	AR	05/12/12			
		G – ROADS WIDENED	AR				

LEGEND

- PROPOSED PUBLIC OPEN SPACE
- MEDIUM DENSITY LOT 5
- VILLAGE CENTRE
- DUAL OCCUPANCY
- RESIDENTIAL LOTS

- STAGE 1
- STAGE 2
- STAGE 3
- STAGE 4
- STAGE 5
- STAGE 6
- STAGE 7
- STAGE 8

LOT 1 DP 1021332 & LOT 458 DP 1063107	NUMBER OF LOTS	AREA
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DP 1102909

LOT 6
DP 1156684

LOT 4
DP 1156684

6
DP 1156684

LOT 384
DP 755952

GEORGE EVANS ROAD

ROAD 1

ROAD 2

ROAD 3

ROAD 4

ROAD 5

ROAD 6

JONSSON ROAD

(16m WIDE)

(18m WIDE)

LANE 1 (7m WIDE)

OSD BASIN & WETLAND (RETENTION BASIN)

NOTE: RETENTION BASIN TO BE 20m WIDE MINIMUM (AREA TO BE DETERMINED)

PEDESTRIAN ACCESS & OVERLAND FLOW PATH

PROPOSED ROAD WIDENEING

PART CROWN ROAD TO BE CLOSED

UNFORMED

CROWN

OSD/RETENTION BASIN

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		APPROV'D	

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SKETCH PLAN SHOWING BUSHFIRE APZ REQUIREMENTS OVER LOT 1 DP 1021332 & PART LOT 458 DP 1063107 GEORGE EVANS ROAD, MUNDAMIA FOR: SHOALHAVEN CITY COUNCIL

SHEET	OF	SHEETS
A1	3	3

REF. No. 102166

PLAN No. 12/113

ATTACHMENT 5

CONCEPT HYDRANT LAYOUT PLAN

LEGEND

- PROPOSED PUBLIC OPEN SPACE
- MEDIUM DENSITY LOT 5
- VILLAGE CENTRE
- DUAL OCCUPANCY
- RESIDENTIAL LOTS

LOT 1 DP 1021332 & LOT 458 DP 1063107		
	NUMBER OF LOTS	AREA
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LOT 473
DP 1102909

LOT 6
DP 1156684

LOT 4
DP 1156684

6
DP 1156684

LOT 384
DP 755952

EVANS ROAD

GEORGE ROAD

JONSSON ROAD

ROAD 1 (16m WIDE)

ROAD 2 (18m WIDE)

ROAD 3 (18m WIDE)

ROAD 4 (16m WIDE)

ROAD 5 (16m WIDE)

ROAD 6 (16m WIDE)

LANE 1 (7m WIDE)

OSD BASIN & WETLAND (RETENTION BASIN)

NOTE: RETENTION BASIN TO BE 20m WIDE MINIMUM (AREA TO BE DETERMINED)

PEDESTRIAN ACCESS & OVERLAND FLOW PATH

OSD/RETENTION BASIN

PROPOSED ROAD WIDENEING

UNFORMED

PART CROWN ROAD TO BE CLOSED

CROWN

NOTE:
HYDRANT LOCATIONS ARE PRELIMINARY ONLY. TO BE CONFIRMED AS PART OF DETAILED DESIGN PLANS

LEGEND

- PROPOSED WATER MAIN
- HYDRANT

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SCALE
1:1000 @ A1
1:2000 @ A3

DATUM
AHD

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DESIGN	AR
DRAWN	MN
CHECKED	AR
APPROV'D	

AMENDMENTS	BY	DATE
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SURVEYING | ENGINEERING | TOWN PLANNING

PRELIMINARY HYDRANT LOCATION PLAN
OVER LOT 1 DP 1021332 & PART LOT 458 DP 1063107
GEORGE EVANS ROAD, MUNDAMIA
FOR: SHOALHAVEN CITY COUNCIL

SHEET		OF	
A1	1	1	SHEETS

REF. No. 102166

PLAN No. 12/98