Environmental Assessment

Volume 1

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

April 2013
Reference: 102166

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ENVIRONMENTAL 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

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Date: 7 May 2013

This report has been prepared for Shoalhaven City Council and the Nowra Local Aboriginal Land Council (landowners of Lot 1 DP 1021332 & Part Lot 458 DP 1063107 George Evans Road, Mundamia), in accordance with the scope of services required by Shoalhaven City Council to comply with the EP & A Act 1979.

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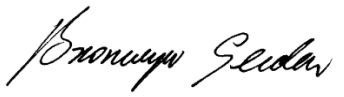
109 LOT SUBDIVISION (105 RESIDENTIAL LOTS, VILLAGE CENTRE AND PUBLIC OPEN SPACE)

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

ENVIRONMENTAL ASSESSMENT CERTIFICATION

Statement on Validity of the Environmental Assessment

This Environmental Assessment has been prepared in relation to Project Application No. 09_0056, which relates to a proposed 109 Lot subdivision with neighbourhood shops and community facility of Lot 1 DP 1021332 and Part Lot 458 DP 1063107, George Evans Road, Mundamia. The information contained in the Environmental Assessment has been compiled from site inspections, file notes, correspondence and reports prepared by appropriately qualified consultants and is neither deliberately false nor misleading.



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EXECUTIVE SUMMARY

The subject land is located within an urban release area referred to as New Living Area No. 5 identified in the *Shoalhaven Council's Nowra Bomaderry Structure Plan* (Figure 2), which was endorsed by the NSW Department of Planning in February 2008. The *Nowra Bomaderry Structure Plan* has included extensive specialist investigations and studies undertaken over several years to determine the areas suitable for residential development incorporating all socio-economic and environmental factors. The Structure Plan also went through an exhaustive public and agency consultation process.

This application proposes a one hundred and nine (109) lot subdivision including 105 residential lots, a village centre and public open space on the subject site, which consists of Lot 1 DP 1021332 and Part Lot 458 DP 1063107 George Evans Road, Mundamia. The subject land is an irregular shaped area of some 12.3ha with maximum north-south and east-west dimensions of 600m and 330m respectively. The site is located 4km south west from the Nowra CBD and is approximately 200m north of the Shoalhaven University Campus and approximately 300m south of the Shoalhaven River. The site is bounded by George Evans Road, Jonsson Road and the proposed spine road (unformed crown road). The subject site is zoned 1(d) Rural (General Rural) under Shoalhaven LEP 1985 (as amended). The subdivision will result in a dwelling yield of approximately 173 dwellings with inclusion of single dwelling, dual occupancy and medium density allotments.

The Director-Generals environmental assessment requirements for the preparation of the Environmental Assessment Report (EAR) were received in April 2009 and listed 11 key project specific issues, which are provided in the Table below, along with the relevant sections of the Environmental Assessment where the issues have been addressed.

A range of environmental studies were undertaken and following a more detailed flora and fauna assessment of the subject site, no threatened species were found to exist within the study area. However the study concluded that the proposed development could pose an indirect threat to threatened species such as the Spring Tiny Orchid and Nowra Heath Myrtle located outside of the subject site. For this reason the flora and fauna assessment included areas within 10km of the subject site. Subsequently the final areas for lots and subdivision layout were subject to the outcome of the flora and fauna assessment and other relevant environmental studies. Three alternate layouts were considered before arriving at the final option for the proposed one hundred and nine (109) lot subdivision.

The preferred layout was chosen for a number of reasons including the insertion of larger allotments for the use of both potential dual occupancy and medium density developments. Furthermore the proposed layout was formed so that the village centre can be used to its full advantage by new residents of this subdivision, as well as those from other surrounding future release areas, primarily from the adjacent Lot 384 DP 755952. This street design further reduces the impact on the threatened species, improves bushfire protection and provides public road access to all lots within the subdivision and improving the permeability within the street network.

The proposal also requires a rezoning of the land through the making of the Shoalhaven Local Environmental Plan (LEP) 2009. The Shoalhaven Draft LEP 2009 is yet to be finalised and it is understood that the approval of the project will not occur until gazettal of the Draft LEP under Section 70 of the Environmental Planning and Assessment Act 1979. Furthermore the new city wide Shoalhaven Development Control Plan (DCP), including the chapter for the Mundamia Urban Release Area, has not yet been completed or exhibited. Therefore the application cannot fully address the relative principles and objectives under the new city wide DCP.

Director-General Requirements

General Requirements

Table ES.1: Director-Generals requirements

Requirement No.	Requirement	Relevant Sections of EA
1	An executive summery	Page i
2	A detailed description of the proposal	Section 3
3	An outline of the scope of the project including: • Any development options; • Justification for the project taking into consideration any environmental impact of the project, the suitability of the site and whether the project is in the public interest; • Outline of the staged implementation of the project if applicable	 Section 9.1 Section 7; 9 Section 3.5
4	A thorough site analysis including constraints mapping and description of the existing environment	Section 2.10
5	Consideration of any relevant statutory and non-statutory provision and identification of any non-compliances with such provisions, in particular relevant provisions arising from environmental planning instruments, Regional Strategies (including draft Regional Strategies) and Development Control Plans	Section 4
6	Consideration of the consistency of the project with the objects of the *Environmental Planning and Assessment Act 1979*	Section 4.2.1
7	Consideration of impacts, if any, on matters of National Environmental Significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*	Section 4.1
8	An assessment of the potential impacts of the project and a draft Statement of Commitments, outlining environmental management, mitigation and monitoring measures to be implemented to minimise any potential impacts of the project	Section 7; 8
9	The plans and documents outlined in Attachment 2	See Attachment and Appendices
10	A signed statement from the author of the Environmental Assessment certifying that the information contained in the report is neither false nor misleading	See start of report
11	An assessment of the key issues specified below and a table outlining where in the EA these key issues have been addressed.	See below

Issue No.	Key Project-Specific Issue	Relevant Sections of EA
1	<u>Strategic Planning:</u> 1.1 Justify the proposal with reference to the relevant local, regional and State planning strategies, policies and plans, including the *Mundamia Master Plan.* Provide justification for any inconsistencies. 1.2 Demonstrate consistency with the *South Coast Regional Strategy,* specifically the Sustainability Criteria; and use of the delivery of key infrastructure such as electricity, water and sewer as a tool to implement the staging program. 1.3 Address the *Nowra-Bomaderry Structure Plan,* specifically the Considerations, Desired Future Character, and Planning and Design Principles identified for the area. Address how the proposal will be linked to the remainder of the new Living Area (not included as part of the proposal) identified within the Structure Plan. Initiate 1.4 Address the findings of the investigative work for the Draft Shoalhaven Comprehensive LEP (Draft LEP). Address the permissibility framework provided by the Draft LEP, noting that approval of the Major Project will not occur until gazettal of the Draft LEP.	Section 4.6.2 Section 4.4.2 Section 4.6.3 Section 4.5
2	<u>Subdivision Design, Layout and Desired Future Character</u>: 2.1 Demonstrate the consistency of the proposal with the character of existing development in terms of the locality, street frontage, scale, building envelopes and future built form controls, aesthetics, energy and water efficiency and safety. 2.2 Clarify the proposed street layout and residential development boundary, including any areas of vegetation to be cleared, and demonstrate that it is consistent with the *Nowra-*	Section 3 Sections 3; 4.3.3; 7.5

Issue No.	Key Project-Specific Issue	Relevant Sections of EA
	Bomaderry Structure Plan, particularly with respect to DECC's submission dated 27 March 2009.	
	2.3 Demonstrate the consistency of the proposed subdivision design and layout with the *Coastal Design Guidelines for NSW, NSW Coastal Policy 1997* and *SEPP 71 Coastal Protection.*	Section 4.3.4; 4.3.7
	2.4 Identify the type of subdivision proposed across the site (i.e. Community, Torrens, Strata). A draft community management statement should be provided if community title is proposed.	Section 3
	2.5 Provide details of potential building envelope, built form, design quality and 'safety by design' controls and the means for implementing them.	Section 3
	2.6 Demonstrate a subdivision layout that accommodates housing choice with a mix of medium density and detached dwellings, and potentially some appropriate student accommodation.	Section 3
	2.7 Provide details of any staging that demonstrates the lots will be released in an orderly and coordinated manner.	Section 3.5
	2.8 Outline the long-term management and maintenance of any area of open space or conservation, including ownership and control, management and maintenance funding, public access, revegetation and rehabilitation work, and bushfire management.	Section 8.2
3	<u>Visual Impact:</u> 3.1 Address the visual impact of the proposal in the context of surrounding development and relevant mitigation measure. In particular address impact on the amenity of the foreshore, overshadowing of public reserves, loss of views from public places and cumulative impacts.	Section 7.9
4	<u>Infrastructure Provision:</u> 4.1 Address existing capacity and requirements of the development for sewerage, water, electricity, waste disposal, telecommunications and gas in consultation with relevant agencies. Identify and describe staging, if any, of infrastructure works.	Section 3.6
	4.2 Address and provide the likely scope of any planning agreements and/or development contributions with Council/Government agencies (including relevant community/state infrastructure contributions).	Section 4.4
5	<u>Traffic and Access</u>: 5.1 Prepare a Traffic Impact Study in accordance with Table 2.1 of the RTA's *Guide to Traffic Generating Developments* which addresses matters, including: • Assessment of the suitability of key junctions to accommodate the proposal, including the existing, local road network and the Albatross and Yawal Roads intersection; • Justification of traffic volumes and directional splits adopted in the SIDRA analysis; • Identity suitable treatments required to ameliorate any traffic and/road safely impacts associated with the proposal; • Examine existing pedestrian movements and potential alterations to pedestrian desire lines, and identify appropriate treatments ; and • Environmental impacts of any proposed road works.	Section 7.8 Section 3.4
	5.2 Undertake intersection modelling, where relevant, using SIDRA for all key junctions in the area, including analysis of: • AM and PM peak volumes with and without development during the above peak periods; and • 10 year projected volumes with and without the proposal.	Section 7.8
6	<u>Hazard Management and Mitigation:</u> 6.1 *Coastal Processes* – Address coastal hazards and the provisions of the *Coastline Management Manual.* In particular, consider impacts associated with wave and wind action, coastal erosion, sea level rise and more frequent and intense storms. Provide details of proposed safeguards to mitigate any impacts of such hazards on the proposal.	Section 2.7
	6.2 *Contamination* – Prepare a preliminary contamination assessment, identifying and contamination on site and appropriate mitigation measures in accordance with the provisions of *SEPP 55 – Remediation of Land.*	Section 4.4.3

Issue No.	Key Project-Specific Issue	Relevant Sections of EA
	6.3 *Acid Sulfate Soils* – Identify the presence and extent of acid sulphate soils on the site and, where relevant, appropriate mitigation measure.	Section 7.7
	6.4 *Bushfire* – Address the requirements of *Planning for Bush Fire Protection 2006* (RFS). Demonstrate that the proposal can provide asset protection zones, access arrangements, water supplies and utilities, building construction and design, and emergency management arrangements in accordance with *Planning for Bush Fire Protection 2006.*	Section 7.6
	6.5 *Geotechnical* – Provide an assessment of any geotechnical limitations that may occur on the site and if necessary, appropriate design considerations that address these limitations.	Section 2.2; 2.3; 2.5; 7.7
	6.6 *Flooding* – Provide an assessment of any flood risk on site (for the full range of floods including events greater than the design flood, up to probable maximum flood; and from coastal inundation, catchment based flooding or a combination of the two) and having consideration of any relevant provision of the *NSW Floodplain Development Manual 2005.* The assessment should determine: the flood hazard in the area; address the impact of flooding on the proposed development, address the impact of the development (including filling) on flood behaviour of the site and adjacent lands; and address adequate egress and safety in a flood event.	Section 2.7
	6.7 Undertake a risk management assessment of climate change impacts to the year 2100 using the latest available information from the International Panel on Climate Change (IPCC), Department of Environment and Climate Change (DECC), and the CSIRO, and in accordance with the NSW Government *Draft Sea Level Rise Policy Statement* (Feb 2009). This should include sensitivity analyses for low level, mid-range and high level ocean impacts as set out in the relevant DECC Guideline *(Floodplain Risk Management Guideline: Practical Consideration of Climate Change, 2007).*	Section 2.7
	6.8 Assess the potential impacts of sea level rise and an increase in rainfall intensity on the flood regime of the site and adjacent lands with consideration of *Practical Consideration of Climate Change – Floodplain Risk Management Guideline (DECC, October 2007) and the Draft Sea Level Rise Policy Statement* (NSW Government, Feb 2009).	Section 2.7
7	<u>Water Cycle Management:</u>	
	7.1 Address and outline measures for Integrated Water Cycle Management (including stormwater) based on Water Sensitive Urban Design principles which address impacts on the surrounding environment, mitigate impacts on water quality downstream, drainage and water quality controls for the catchment, and erosion and sedimentation controls at construction and operational stages.	Section 7.1
	7.2 Assess the impact of the proposal on the surface and groundwater hydrology and quality, potential degradation to the groundwater source, and on groundwater dependent ecosystems. If potential impacts are identified, assess the limits to the level of impact and contingency measures.	Section 2.5; 7.1
	7.3 Address safeguards to mitigate any impacts upon water quality, including impacts downstream on Flat Rock Creek, Flat Rock Creek Dam and the Shoalhaven River. Provide details of proposed effluent management, stormwater, road drainage, and water quality management for the site, for example, description and location s of on-site wastewater systems, swales, water quality retention ponds, etc), and, if relevant, of the Flat Rock Creek Notification Area under the *Mining Act 1992* (NSW) and the *Dam Safety Act 1978* (NSW).	Section 7.1
	7.4 Include consideration of any specific existing or draft Estuary Management Plan and Coastline Management Plan.	Section 7.1
	7.5 Provide information relating to existing or proposed water management structures/dams, where applicable.	Section 7.1
8	<u>Heritage and Archaeology:</u>	
	8.1 Identify whether the site has significance to Aboriginal cultural heritage, the nature and extent of any impacts, and appropriate measures to preserve any significance. The assessment must address the information and consultation requirements of the draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation (DEC 2005)* and *Interim Community Consultation Requirements for Applicant (DEC 2004).*	Section 7.4
	8.2 Identify any items of non-indigenous heritage significance and, where relevant, provide measures for the conservation of such items.	Section 7.4

Issue No.	Key Project-Specific Issue	Relevant Sections of EA
9	Flora and Fauna	
	9.1 Prepare a Flora and Fauna Assessment Report in accordance with the *Draft Guidelines for Threatened Species Assessment* (DEC, DPI, Jul 2005), and the *Threatened Species Assessment Guidelines: The Assessment of Significance* (DECC Aug 2007), addressing potential impacts of the development on the flora and fauna of the site and setting in the landscape, particularly impacts on any threatened species where known. Surveys should target the *Triplarina nowraenses* and the assessment should demonstrate that the proposal will have minimal impact on this species. Provide measures for the conservations of flora and fauna, habitats and communities, where relevant, including the provision of adequate vegetated buffers, particularly on the eastern side bordering the Flat Rock Creek Gully.	Section 2.4; 7.5
	9.2 Address the potential bio-certification of the Draft Shoalhaven Comprehensive LEP 2009. Any native vegetation proposed to be removed within the area identified by DECC (see letter dated 27 March 2009 at Attachment 4), needs to be offset in accordance with the principles of 'maintain and improve' environmental outcomes.	N/A
	9.3 Resolve the provision of arterial road access for the proposal and any impacts on threatened species assessed using the 'avoid, mitigate or offset' framework.	Section 7.5; 7.8
	9.4 Outline measure for the conservation of existing wildlife corridor values and/or connective importance of any vegetation on the subject land. Investigate opportunities to conserve or enhance local and regional corridors and important habitats, such as creek lines, in the design of the proposal.	Section 7.5
	9.5 Describe all aquatic environments (watercourse, wetlands) located on or adjacent to the site, and their regional significance.	Section 7.1
	9.6 Predict impact upon aquatic environments on or adjacent to the site (both temporary and permanent). Predict any temporary and permanent impacts upon water quality and aquatic threatened species, populations, ecological communities listed under the *Fisheries Management Act 1994* (NSW).	Section 7.1
	9.7 Assess any impacts and address measures and safeguards to mitigate impacts of the proposal on watercourses, associated riparian vegetation, and adjacent aquatic habitats, including SEPP 14 wetlands. Provide full details and widths of proposed riparian zones for Flat Rock Creek Recommended core riparian zones (where applicable) are: 10m (minimum) for any intermittently following 1st order watercourse; 20m for any permanently flowing.	Section 7.1
	9.8 Address impacts on migratory species, RAMSAR wetlands and species listed under Section 18 and 18A of the EPBC Act.	Section 7.5
10	Noise:	
	10.1 Address potential noise impacts (existing and proposed) on the development, particularly from road traffic and aircraft/defence operation, and the proposed Bamarang Power Station Stage 2 (08_0021). Address appropriate mitigation measures to ameliorate any identified noise impact.	Section 7.2
	10.2 Assess the noise targets for internal spaces referenced in *AS2021:2000 – Acoustics – Aircraft Noise Intrusion – Building Siting and Construction (AS2021)* in the assessment of potential noise impacts. The targets can be found at Table 3.3 *Indoor design sound levels for determination of aircraft noise reduction of AS2021.*	Section 7.2
11	Aviation/Defence	
	11.1 Address potential impacts of the proposal on the operations of HMAS Albatross, and consider flight path impacts from military aircraft operations on the proposal.	Section 7.2

The proposed subdivision will create one hundred and nine (109) allotments covering a combined 11.7ha. The proposed subdivision will be constructed and released in eight (8) stages as outlined in part 3.5 of the report. Access to the subdivision will be via the extension of George Evans Road, Jonsson Road, and the new connecting spine road off George Evans Road.

All 109 lots will have frontage to the proposed new road network with orientation either east-west or north-south. The residential lots have areas ranging in size from 501m^2 to 5690m^2 with the commercial allotment being 7703m^2 and the remaining public open spaces lots being 519m^2 to 8644m^2.

There are a number of site attributes and constraints that have been taken into consideration in the design of the subdivision layout. The final design is reflective of the inherent constraints and positive attributes associated with the subject site. The subdivision layout is considerate of the site's environmental sensitivity whilst accommodating the economic reality of the current property market. The design principles incorporate bush fire mitigation measures and protection of the Endangered Ecological Community. The urban stormwater concept has been designed in a manner sympathetic to the natural constraints of the site.

A number of site investigations and reports have been prepared as part of the risk assessment analysis conducted in the preparation of this Environmental Assessment. The aim of this analysis was to identify all key environmental risk factors relevant to the project and to enable appropriate management to be take into consideration during the design of the subdivision layout. Overviews of the main findings are provided below.

Stormwater Management Plan

A stormwater management assessment was prepared by Martens Consulting Engineers Pty Ltd in December 2012. The report details an environmentally sustainable strategy for the management of stormwater generated from the site as well as detailing existing stormwater conditions at the site and likely impacts resulting from the proposed development. Assessment of water quality and quantity changes as a result of the proposed land release has been completed using the DRAINS and MUSIC hydrological and water quality models. Analysis included assessment of existing conditions and development conditions. An interactive approach was used to determine the requirements for the site on-site detention as well as the need for, and preliminary dimensions/capacities of water quality structures to achieve adopted site objective of ;no change' hydrological regime.

The analysis indicated that even with best practice water quality and quantity control solutions as developed in this assessment it is not feasible to achieve a post development surface water regime which mimics the pre-development condition exactly. The proposed development does not have an adverse impact on downslope areas (in terms of increased peak discharge rates and pollutant loads) based on detailed hydrological and water quality modelling completed. Site OSD basins are designed to mitigate peak discharges for critical duration storms for recurrence intervals from the 1 in 3 month ARI to the 1 in 100 year ARI. Results indicate that post-development water quality objectives, in terms of pollutant retention and change in mean annual loads, will be met by the proposed stormwater treatment train.

Aboriginal Heritage Assessment

Navin Officer Heritage Consultants Pty Ltd originally conducted a field survey for the Mundamia subdivision development in October 2012. The report concluded that no Aboriginal site has been previously recorded in the vicinity of the current study area and no Aboriginal sites were recorded during the current study. As there are no areas of predicted Archaeological sensitivity within the study area, it was recommended that no further investigations are necessary for the subdivision. However it was also recommended that the protocols for the unanticipated discovery of archaeological material suspected human remains be adopted and complied with during construction activities involving ground surface disturbance and excavation.

Flora and Fauna Assessment

Eco Logical Australia Pty Ltd were engaged by SET Consultants to prepare a Flora and Fauna Assessment. The proposal is concentrated on an area substantially degraded by previous quarrying activities that generally provides poor or marginal habitats and resources for flora and fauna species. The removal of vegetation from the subject site will not substantially affect habitat connectivity in the area nor increase fragmentation given the disturbances within and surrounding the site. The extent of habitat or vegetation to be removed is considered a minor impact in the context of the available resources in the locality.

As a result of database searches, literature review and field studies, the following species were considered likely to occur in the subject site and/or could be affected by the proposal. The potential impact of the proposal on these species has been assessed under relevant legislation. The threatened and migratory species with the potential to occur in the study area or to be affected by the proposal are listed in the table below.

Scientific Name	Common Name	Occurrence
Triplarina nowraensis	Nowra Heath Myrtle	Nearby
Pterostylis vernalis *Pterostylis* sp. Flat Rock Creek	Spring Tiny Greenhood	Nearby
Calyptorhynchus lathami	Glossy-black Cockatoo	Known
Callocephalon fimbriatum	Gang-gang Cockatoo	Potential
Ninox strenua	Powerful Owl	Potential
Lophoictinia isura	Square-tailed Kite	Potential
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Potential
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	Potential
Mormopterus norfolkensis	East Coast Freetail Bat	Potential
Pteropus poliocephalus	Grey-headed Flying-Fox	Potential
Scoteanax rueppellii	Greater Broad-nosed Bat	Potential
Petaurus australis	Yellow-bellied Glider	Potential
Varanus rosenbergi	Rosenberg's Goanna	Potential

Eco Logical Pty Ltd conducted an assessment of significance under Section 5A of the EPA Act on those species with potential to occur on the site or otherwise be affected by the proposal. The outcome of the assessment was that it is unlikely that the development would significantly impact on those threatened fauna species assessed. Provided that effective measures to further investigate, mitigate and manage indirect impacts to nearby *Pterostylis ventricosa* and *Triplarina nowraensis* habitat arimplemented as part of the proposal, it is unlikely that the development would significantly impact on threatened flora species. The seven-part test completed by Eco Logical Pty Ltd outlined the proximity and potential impact the proposal may have on the abovementioned species as discussed below.

Eco Logical Pty Ltd concluded that the proposal is located primarily in an area of severe historic disturbances, which greatly limits the value of the subject site for threatened flora and fauna species. The direct impacts of the proposal on threatened species are minimal. No endangered populations or ecological communities occur

in our or near the study area. However, beyond the subject site are species and habitats of considerable conservation value, primarily for the threatened plants *Triplarina nowraensis* and *Pterostylis vernalis,* which are susceptible to indirect impacts from the proposal. These indirect impacts need to be addressed and controlled, with additional protection given to nearby areas containing the species or suitable habitat for the species. Provided that measures to mitigate and manage the indirect impacts the proposal are applied it is unlikely that the proposal will result in significant impacts to any threatened species. On the basis of the above Eco Logical Pty Ltd therefore concluded that a Species Impact Statement would not be required for the proposal.

Bushfire Protection Assessment

A Bushfire Protection Assessment (Appendix 3)prepared by SET Consultants Pty Ltd concluded that 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. 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 outlined in Table 3 and shown in Appendix 3. 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 1021332 & Part Lot 458 DP 1063107 is undertaken in accordance with the recommendations outlined above it will comply with performance requirements provided in *Planning for Bushfire Protection* (2006) and will provided adequate provision for fire fighting strategies.

Acid Sulfate Soils

According to the Shoalhaven City Council State of the Environment (SCC SOE) online Acid Sulphate Map the site is classified as 'No known occurrence' of ASS. As part of the Geotechnical Assessment prepared by Martens and Associates fifteen soil samples were screened using field and oxidised pH. Initial pH results indicated a potential for ASS on site and additional laboratory analysis was undertaken. sPOCUS analysis was undertaken on all fifteen samples. Laboratory results indicate that levels are above the Acid Sulfate Soils Management Advisory Committee (ASSMAC) guidelines. Location of samples above the ASSMAC guidelines are distributed widely across the site in both natural and fill horizons with no identified pattern of distribution. Martens concluded that given the sites location and residual soil landscape on rock, the origin of soil potential acidity is likely the underlying geology.

An Acid Sulphate Soils Management Plan will be prepared as part of the documentation to support a construction certificate application for Stage 1 construction. The ASS management plan will provide a framework for achieving environmental objectives in order to minimise the risk of harm to human health and the environment during and following the proposed development. The ASS management plan will outline the procedure for neutralisation the disturbed soil in order to minimise the potential for adverse environmental impact.

Traffic Impact Assessment

Biztos Consulting Pty Ltd were engaged to undertake a Traffic Impact Study. The road network in the vicinity of the site includes the Princess Highway, Kalandar Street, Albatross Road, Yalwal Road, George Evans Road, Jonsson Road and Stonegarth Road

The proposed subdivision involves the creation of six new roads off George Evans Road including the new spine road running along the eastern boundary of the site and the other five being the internal. Although these new roads will need to be adequate for residents and visitors of the new subdivision, the existing main roads within close proximity to the site experience a heavy increase in movements.

Having considered the subject site and its location within Mundamia, it is considered that the majority of the traffic flow along the proposed new roads will be generated by the proposed subdivision. Out of the proposed new roads George Evans Road and the Spine Road will be the most likely roads to experience additional traffic movements in the future as it will create the link to public facilities and to the town centre and university.

The estimated additional traffic generated as a result of the proposal is between 1167 and 1227 vehicle movements per day (during peak holiday period when the occupation rate is 100%), which is well within the capacity of the existing road network as demonstrated in this report. Therefore, it is unlikely that the proposed development will have a detrimental effect on the local traffic and driver safety within the area and surrounding road network.

Cumulative Impact

There are currently six other allotments surrounding the subject site that are included within the Mundamia Masterplan for future residential development. These lots total an area of approximately 36.2ha and an additional 61.81ha lot for a future school site. These lots include:

- Lot 3 DP 568613
- Lot 384 DP 755952
- Lot 2 DP 568613
- Lot 1 DP 568613
- Lot 474 DP 1102909
- Lot 6 DP 1156684 (Future school site / expansion of university)

It is understood that there is potential for some cumulative impacts as a result of the proposed subdivision and associated infrastructure and dwellings. These impacts may include increased pressure on the infrastructure and services; increased pressure on the social infrastructure such as health care and public schools; a reduction in the biodiversity of the local area; and an increased bushfire risk to the local community.

We are of the opinion that overall, the proposed 109 lot subdivision will only have a minimal cumulative impact on the local environment. The proposed road network caters for all road users including, pedestrians, cyclists, cars and buses. Overall the objective of the subdivision layout is to provide a safe, attractive, energy efficient

and liveable neighbourhood that fosters a sense of community and that promotes better social, economic and environmental sustainability.

Conclusion

This Environmental Assessment (EA) demonstrates how the consultant team has addressed the key issues set out in the Director-General's Requirements and has designed a subdivision layout, which minimises its impact on the environment. This assessment demonstrates that the proposed development is consistent with local, state and national legislation and guidelines.

Where potential environmental impacts have been identified, appropriate investigations have been undertaken and the recommended mitigation measures and environmental safeguards have been either designed into the subdivision layout, or are proposed to be constructed as part of the civil infrastructure. The mitigation measures and environmental safeguards will enable the potential environmental impacts to be reduced or contained to within acceptable standards or levels.

The final design is reflective of the inherent constraints and positive attributes associated with the subject site. The proposed development utilises a range of lot sizes, from 501m^2 to 5690m^2. The variety in lot sizes proposed offers the opportunity for a diverse range of housing styles and sizes to be developed. The topography and setting of the site have been utilised in the design to ensure where possible future dwellings have a pleasant outlook to the surrounding bushland.

Having regard to the conclusions and findings contained in this EA, we recommend to the Minister for Planning & Infrastructure that the subdivision layout as detailed in this EA be approved under Part 3A of the Environmental Planning and Assessment Act.

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1 INTRODUCTION

1.1 Background

SET Consultants Pty Ltd have been engaged by Shoalhaven City Council to prepare an Environmental Assessment (EA) for a proposed 109 Lot subdivision comprising of 105 residential lots, neighbourhood shops and a community facility of Lot 1 DP 1021332 and Part Lot 458 DP 1063107. Initially the proposed subdivision layout comprised of only a small portion on the village commercial centre to be included on Council's land, with the remaining of the village centre to be developed with the subdivision on the adjacent Lot 384 DP 755952 as indicated in the Mundamia Masterplan. Shoalhaven City Council and Twynams Pty Ltd (land owner of Lot 384 DP 755952) since negotiated the village centre to be located solely on Councils land being Lot 1 DP 1021332 as shown on the proposed subdivision layout plan (Attachment 1). The decision for the village centre to not be split by the spine road (unformed crown road) and position it on only one side came as an effort to try and improve traffic/pedestrian safety.

As a result of the village centre location being altered, the subdivision layout has been modified a number of times. This has also resulted in the inclusion of three (3) public open space lots, six (6) medium density lots and five (5) potential dual occupancy lots.

The subject site is wholly contained within the coastal zone with no section of the site positioned within the sensitive coastal locations. Given the proposed residential subdivision is within the coastal and is for over 25 lots the project now falls under Part 3A (Major Projects) of the Environmental Planning and Assessment Act 1979 and accordingly an Environmental Assessment is required to be submitted to the Department of Planning for determination.

1.2 The Applicant

SET Consultants Pty Ltd has prepared this Environmental Assessment on behalf of the property owners Shoalhaven City Council and the Nowra Local Aboriginal Land Council.

1.3 Location

Mundamia is located approximately 170km south of Sydney in the Shoalhaven region. The Shoalhaven region stretches 160 kilometres from Berry in the north to Durras in the south (Figure 1.1).

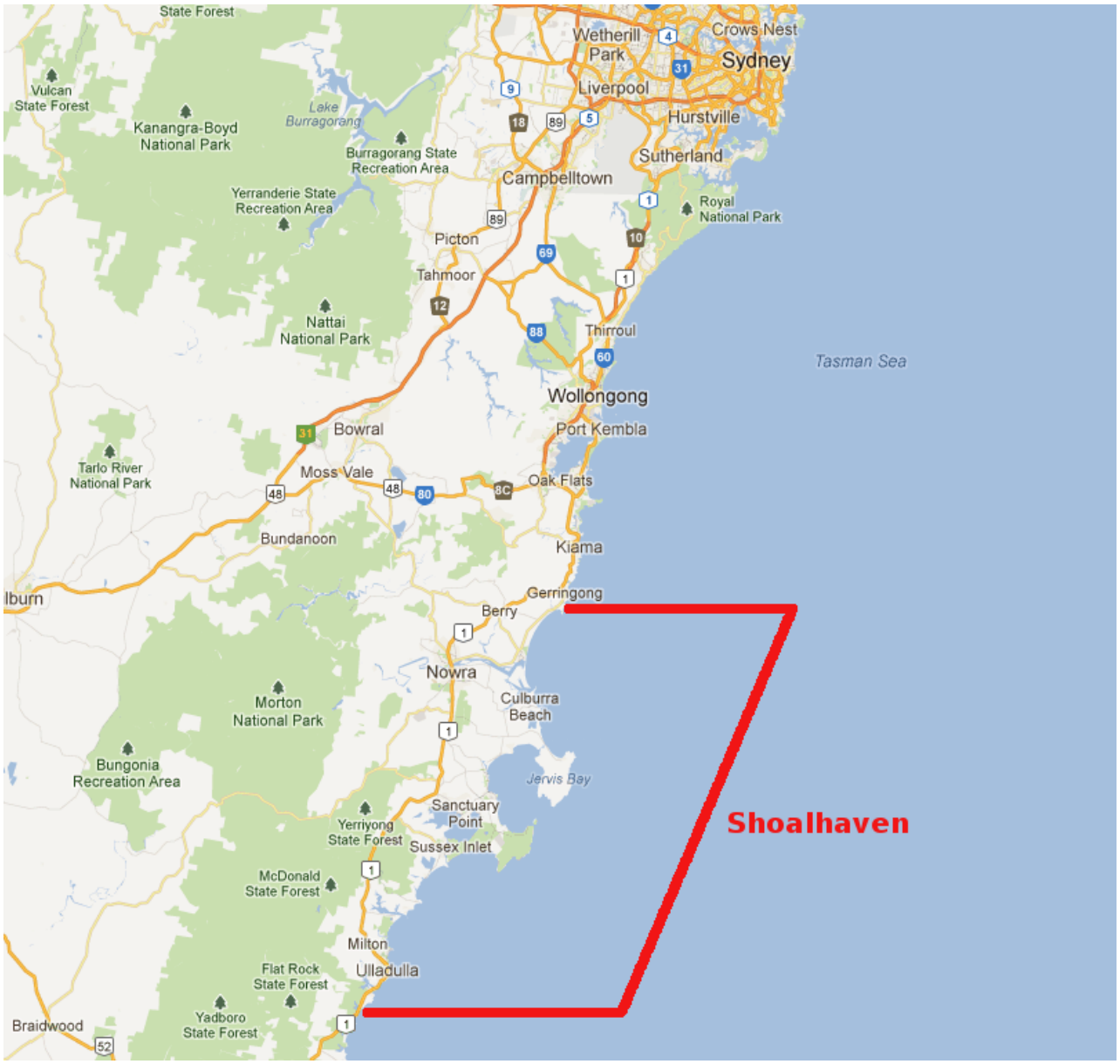

Figure 1.1: Regional Locality Map
Source from Goggle Maps 2012

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. A locality context plan indicating significant local features such as parks, community facilities, public open space, and watercourses is provided in Figure 1.3

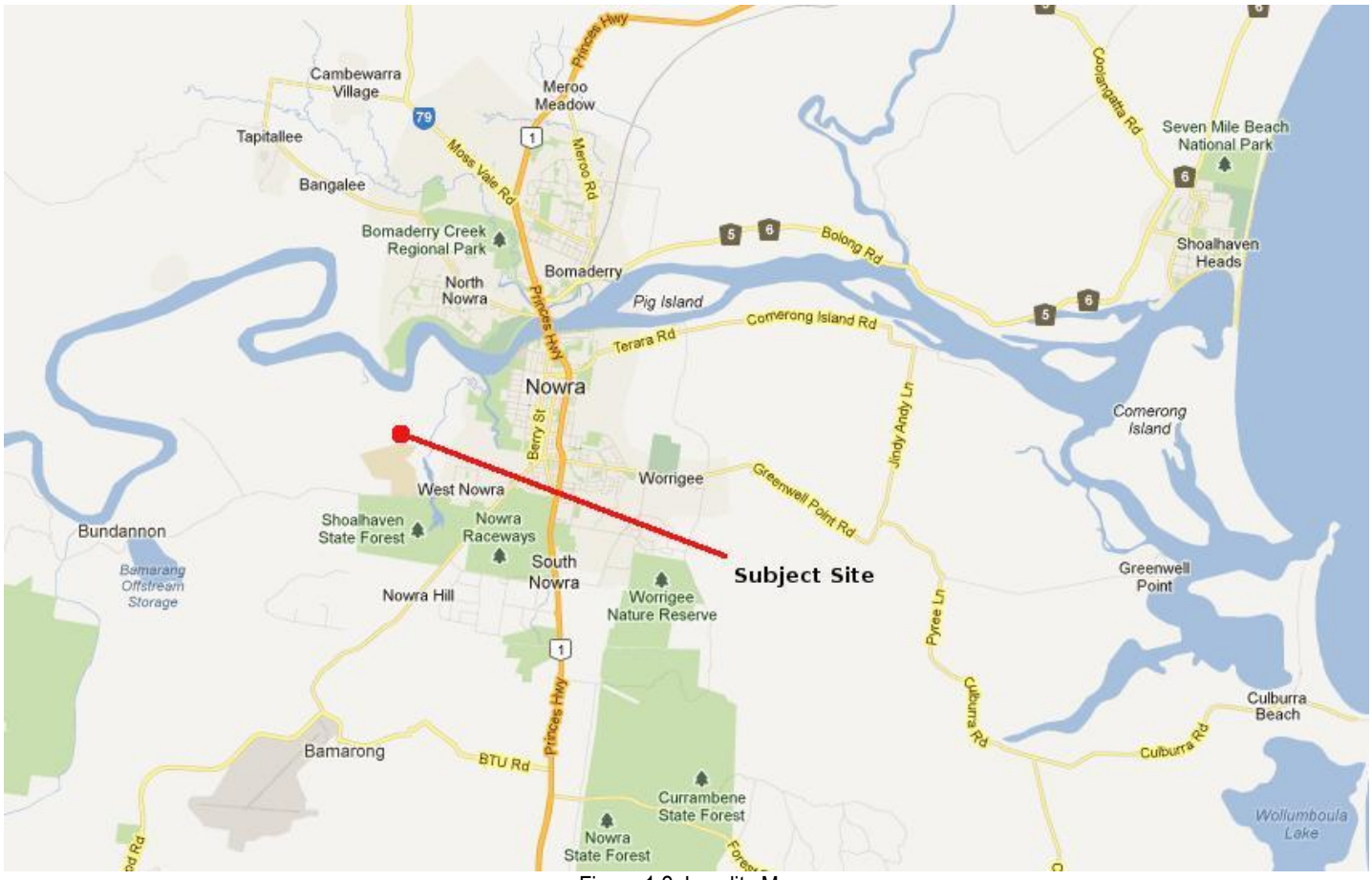

Figure 1.2: Locality Map
Source from Goggle Maps 2012.

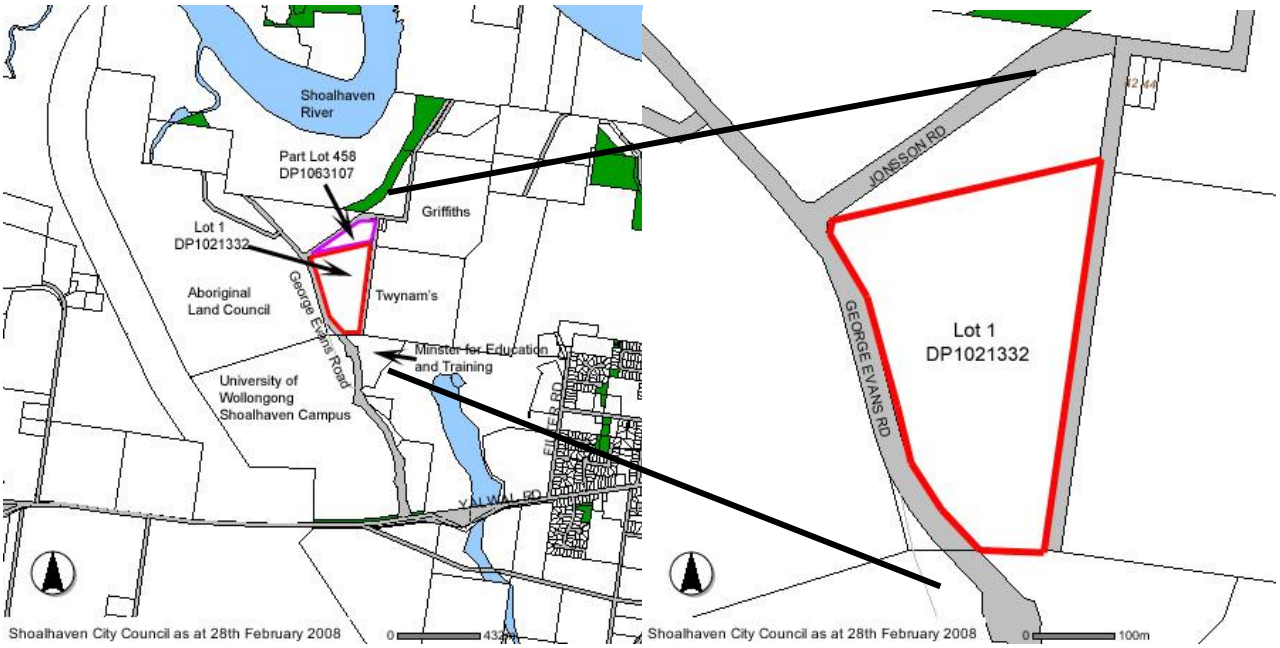

Figure 1.3: Locality Context Plan

1.4 Site Description

The overall site, which consists of Lot 1 DP 1021332 and Part Lot 458 DP 1063107, comprises an irregular shaped area of some 12.3ha with maximum north-south and east-west dimensions of 600m and 330m respectively (Figure 1.3). 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 study area 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.

The site is bound to the north by environmentally protected land (zoned 7(d1) Environment Protection: Scenic) and also further to the east past Lot 384 DP 755952. More rural land continues to south and east of the site. The closest residential zoned land is approximately 1km to the east in West Nowra.

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.

Figure 1.4: Location shown on a topographic map

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.

The site lies at an altitude of approximately 60-70m 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 3º - 5º) 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).

The surrounding area (Figure 5) to the subject site comprises crown land, the University of Wollongong Shoalhaven campus, rural residential properties and unoccupied freehold rural properties. The surrounding area contains a relatively diverse range of vegetation communities including dry sclerophyll woodlands and open-forests with heathy understoreys, shrublands, paperbark forests, and moist taller forests. The crown land is heavily vegetated however, most of the natural vegetation on the privately owned land has been cleared and converted to pasture. The Shoalhaven River is located 580 metres to the north of the site.

The Shoalhaven River has downcut into the massively bedded sandstone creating a broad but relatively shallow (up to 100 m deep) steep-sided gorge. Flat Rock Creek, a higher order tributary of the Shoalhaven River (which has also been downcut by erosion), is located approximately 1.6 kilometres east of the site has also formed narrow, steep sided gullies. Flat Rock Creek flows in a northerly direction past the site to its confluence with the Shoalhaven River.

Figure 1.5: Aerial view of the surrounding area

The climate of the Shoalhaven is best described as coastal temperate and is characterised by warm summers and mild winters. Summer mean daily temperatures range between 16.1°C and 25.8°C. Winter mean daily temperatures range between 6.2°C and 15.8°C. The median rainfall for individual months ranges between 37.6mm in August and 88.4mm in January. The annual average rainfall is 1,142.1mm. During the spring and summer months the prevailing winds are easterlies in the afternoon. In the autumn and winter months this pattern changes to westerly and north westerly prevailing winds which are generally strongest in the morning.

1.5 Environmental Assessment Process

1.5.1 Major Projects

The Environmental Planning and Assessment Act (NSW) 1979 (EP&A Act) is the principal piece of legislation that governs the approval process for the development. Taking effect from 1 August 2005, the EP&A Act was amended by the addition of a new Part 3A which deals with the approval of major projects. Section 75B(1) of the EP&A Act defines development to which Part 3A applies:

This Part applies to the carrying out of development that is declared under this section to be a project to which this Part applies:

(a) by a State environmental planning policy,
or
(b) by order of the Minister published in the Gazette.

Schedule 2 of the State Environmental Planning Policy (SEPP) (Major Projects) 2005 (Major Projects SEPP) identifies development within specified sites which are major projects. The Director-General of the Department of Planning & Infrastructure, under delegation from the Minister for Planning & Infrastructure (the Minister), formed the opinion that the proposed subdivision is considered a Project to which Part 3A of the EP&A Act applies under Schedule 2, Clause 1(1) "*Development within the coastal zone for any of the following purposes:*" (i) "*subdivision of land in a residential zone into more than 25 lots…..wholly or partly within a sensitive coastal location"*. The Project Application has been lodged with the Department of Planning and the subsequent requirements for this Environmental Assessment are provided in Section 1.5.2.

1.5.2 Environmental Assessment Requirements

Section 75F sets out the environmental assessment requirements for approval under Part 3A of EA&A Act 1979. The main requirements in relation to the proposal are:

"(2) When an application is made for the Minister's approval for a project, the Director-General is to prepare environmental assessment requirements having regard to any such relevant guidelines in respect of the project.

(3) The Director-General is to notify the proponent of the environmental assessment requirements. The Director-General may modify those requirements by further notice to the proponent.

(4) In preparing the environmental assessment requirements, the Director-General is to consult relevant public authorities and have regard to the need for the requirements to assess any key issues raised by those public authorities.

(6) The Director-General may require the proponent to include in an environmental assessment a statement of the commitments the proponent is prepared to make for environmental management and mitigation measures on the site".

The Director-Generals environmental assessment requirements for the preparation of the Environmental Assessment (EA) were received in April 2009 and list 11 key project specific issues, which are provided in Table 1.1, along with the relevant sections where the issues have been addressed. A full copy of Director-Generals requirements is provided in Appendix 1.

General Requirements

Table 1.1: Director-Generals requirements

Requirement No.	Requirement	Relevant Sections of EA
1	An executive summery	Page i
2	A detailed description of the proposal	Section 3
3	An outline of the scope of the project including: • Any development options; • Justification for the project taking into consideration any environmental impact of the project, the suitability of the site and whether the project is in the public interest; • Outline of the staged implementation of the project if applicable	 Section 9.1 Section 7; 9 Section 3.5
4	A thorough site analysis including constraints mapping and description of the existing environment	Section 2.10
5	Consideration of any relevant statutory and non-statutory provision and identification of any non-compliances with such provisions, in particular relevant provisions arising from environmental planning instruments, Regional Strategies (including draft Regional Strategies) and Development Control Plans	Section 4

6	Consideration of the consistency of the project with the objects of the *Environmental Planning and Assessment Act 1979*	Section 4.2.1
7	Consideration of impacts, if any, on matters of National Environmental Significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*	Section 4.1
8	An assessment of the potential impacts of the project and a draft Statement of Commitments, outlining environmental management, mitigation and monitoring measures to be implemented to minimise any potential impacts of the project	Section 7; 8
9	The plans and documents outlined in Attachment 2	See Attachment and Appendices
10	A signed statement from the author of the Environmental Assessment certifying that the information contained in the report is neither false nor misleading	See start of report
11	An assessment of the key issues specified below and a table outlining where in the EA these key issues have been addressed.	See below

Issue No.	Key Project-Specific Issue	Relevant Sections of EA
1	<u>Strategic Planning:</u> 1.5 Justify the proposal with reference to the relevant local, regional and State planning strategies, policies and plans, including the *Mundamia Master Plan.* Provide justification for any inconsistencies. 1.6 Demonstrate consistency with the *South Coast Regional Strategy,* specifically the Sustainability Criteria; and use of the delivery of key infrastructure such as electricity, water and sewer as a tool to implement the staging program. 1.7 Address the *Nowra-Bomaderry Structure Plan,* specifically the Considerations, Desired Future Character, and Planning and Design Principles identified for the area. Address how the proposal will be linked to the remainder of the new Living Area (not included as part of the proposal) identified within the Structure Plan. 1.8 Address the findings of the investigative work for the Draft Shoalhaven Comprehensive LEP (Draft LEP). Address the permissibility framework provided by the Draft LEP, noting that approval of the Major Project will not occur until gazettal of the Draft LEP.	Section 4.6.2 Section 4.4.2 Section 4.6.3 Section 4.5
2	<u>Subdivision Design, Layout and Desired Future Character</u>: 3.1 Demonstrate the consistency of the proposal with the character of existing development in terms of the locality, street frontage, scale, building envelopes and future built form controls, aesthetics, energy and water efficiency and safety. 3.2 Clarify the proposed street layout and residential development boundary, including any areas of vegetation to be cleared, and demonstrate that it is consistent with the *Nowra-Bomaderry Structure Plan,* particularly with respect to DECC's submission dated 27 March 2009. 3.3 Demonstrate the consistency of the proposed subdivision design and layout with the *Coastal Design Guidelines for NSW, NSW Coastal Policy 1997* and *SEPP 71 Coastal Protection.* 3.4 Identify the type of subdivision proposed across the site (i.e. Community, Torrens, Strata). A draft community management statement should be provided if community title is proposed. 3.5 Provide details of potential building envelope, built form, design quality and 'safety by design' controls and the means for implementing them. 3.6 Demonstrate a subdivision layout that accommodates housing choice with a mix of medium density and detached dwellings, and potentially some appropriate student accommodation. 3.7 Provide details of any staging that demonstrates the lots will be released in an orderly and coordinated manner. 3.8 Outline the long-term management and maintenance of any area of open space or conservation, including ownership and control, management and maintenance funding, public access, revegetation and rehabilitation work, and bushfire management.	Section 3 Sections 3; 4.3.3; 7.5 Section 4.3.4; 4.3.7 Section 3 Section 3 Section 3 Section 3.5 Section 8.2
3	<u>Visual Impact:</u> 3.1 Address the visual impact of the proposal in the context of surrounding development and relevant mitigation measure. In particular address impact on the amenity of the foreshore, overshadowing of public reserves, loss of views from public places and cumulative impacts.	Section 7.9

Issue No.	Key Project-Specific Issue	Relevant Sections of EA
4	Infrastructure Provision: 4.1 Address existing capacity and requirements of the development for sewerage, water, electricity, waste disposal, telecommunications and gas in consultation with relevant agencies. Identify and describe staging, if any, of infrastructure works. 4.2 Address and provide the likely scope of any planning agreements and/or development contributions with Council/Government agencies (including relevant community/state infrastructure contributions).	Section 3.6 Section 4.4
5	Traffic and Access: 5.1 Prepare a Traffic Impact Study in accordance with Table 2.1 of the RTA's *Guide to Traffic Generating Developments* which addresses matters, including: • Assessment of the suitability of key junctions to accommodate the proposal, including the existing, local road network and the Albatross and Yawal Roads intersection; • Justification of traffic volumes and directional splits adopted in the SIDRA analysis; • Identity suitable treatments required to ameliorate any traffic and/road safely impacts associated with the proposal; • Examine existing pedestrian movements and potential alterations to pedestrian desire lines, and identify appropriate treatments ; and • Environmental impacts of any proposed road works. 5.2 Undertake intersection modelling, where relevant, using SIDRA for all key junctions in the area, including analysis of: • AM and PM peak volumes with and without development during the above peak periods; and • 10 year projected volumes with and without the proposal.	Section 7.8 Section 3.4 Section 7.8
6	Hazard Management and Mitigation: 6.1 *Coastal Processes* – Address coastal hazards and the provisions of the *Coastline Management Manual.* In particular, consider impacts associated with wave and wind action, coastal erosion, sea level rise and more frequent and intense storms. Provide details of proposed safeguards to mitigate any impacts of such hazards on the proposal. 6.2 *Contamination* – Prepare a preliminary contamination assessment, identifying and contamination on site and appropriate mitigation measures in accordance with the provisions of *SEPP 55 – Remediation of Land.* 6.3 *Acid Sulfate Soils* – Identify the presence and extent of acid sulphate soils on the site and, where relevant, appropriate mitigation measure. 6.4 *Bushfire* – Address the requirements of *Planning for Bush Fire Protection 2006* (RFS). Demonstrate that the proposal can provide asset protection zones, access arrangements, water supplies and utilities, building construction and design, and emergency management arrangements in accordance with *Planning for Bush Fire Protection 2006.* 6.5 *Geotechnical* – Provide an assessment of any geotechnical limitations that may occur on the site and if necessary, appropriate design considerations that address these limitations. 6.6 *Flooding* – Provide an assessment of any flood risk on site (for the full range of floods including events greater than the design flood, up to probable maximum flood; and from coastal inundation, catchment based flooding or a combination of the two) and having consideration of any relevant provision of the *NSW Floodplain Development Manual 2005.* The assessment should determine: the flood hazard in the area; address the impact of flooding on the proposed development, address the impact of the development (including filling) on flood behaviour of the site and adjacent lands; and address adequate egress and safety in a flood event. 6.7 Undertake a risk management assessment of climate change impacts to the year 2100 using the latest available information from the International Panel on Climate Change (IPCC), Department of Environment and Climate Change (DECC), and the CSIRO, and in accordance with the NSW Government *Draft Sea Level Rise Policy Statement* (Feb 2009). This should include sensitivity analyses for low level, mid-range and high level ocean impacts as set out in the relevant DECC Guideline *(Floodplain Risk Management Guideline: Practical Consideration of Climate Change, 2007).* 6.8 Assess the potential impacts of sea level rise and an increase in rainfall intensity on the	Section 2.7 Section 4.4.3 Section 7.7 Section 7.6 Section 2.2; 2.3; 2.5; 7.7 Section 2.7 Section 2.7 Section 2.7

Issue No.	Key Project-Specific Issue	Relevant Sections of EA
	flood regime of the site and adjacent lands with consideration of *Practical Consideration of Climate Change – Floodplain Risk Management Guideline (DECC, October 2007) and the Draft Sea Level Rise Policy Statement* (NSW Government, Feb 2009).	
7	Water Cycle Management:	
	7.6 Address and outline measures for Integrated Water Cycle Management (including stormwater) based on Water Sensitive Urban Design principles which address impacts on the surrounding environment, mitigate impacts on water quality downstream, drainage and water quality controls for the catchment, and erosion and sedimentation controls at construction and operational stages.	Section 7.1
	7.7 Assess the impact of the proposal on the surface and groundwater hydrology and quality, potential degradation to the groundwater source, and on groundwater dependent ecosystems. If potential impacts are identified, assess the limits to the level of impact and contingency measures.	Section 2.5; 7.1
	7.8 Address safeguards to mitigate any impacts upon water quality, including impacts downstream on Flat Rock Creek, Flat Rock Creek Dam and the Shoalhaven River. Provide details of proposed effluent management, stormwater, road drainage, and water quality management for the site, for example, description and location s of on-site wastewater systems, swales, water quality retention ponds, etc), and, if relevant, of the Flat Rock Creek Notification Area under the *Mining Act 1992* (NSW) and the *Dam Safety Act 1978* (NSW).	Section 7.1
	7.9 Include consideration of any specific existing or draft Estuary Management Plan and Coastline Management Plan.	Section 7.1
	7.10 Provide information relating to existing or proposed water management structures/dams, where applicable.	Section 7.1
8	Heritage and Archaeology:	
	9.1 Identify whether the site has significance to Aboriginal cultural heritage, the nature and extent of any impacts, and appropriate measures to preserve any significance. The assessment must address the information and consultation requirements of the draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation (DEC 2005)* and *Interim Community Consultation Requirements for Applicant (DEC 2004).*	Section 7.4
	8.2 Identify any items of non-indigenous heritage significance and, where relevant, provide measures for the conservation of such items.	Section 7.4
9	Flora and Fauna	
	9.9 Prepare a Flora and Fauna Assessment Report in accordance with the *Draft Guidelines for Threatened Species Assessment* (DEC, DPI, Jul 2005), and the *Threatened Species Assessment Guidelines: The Assessment of Significance* (DECC Aug 2007), addressing potential impacts of the development on the flora and fauna of the site and setting in the landscape, particularly impacts on any threatened species where known. Surveys should target the *Triplarina nowraenses* and the assessment should demonstrate that the proposal will have minimal impact on this species. Provide measures for the conservations of flora and fauna, habitats and communities, where relevant, including the provision of adequate vegetated buffers, particularly on the eastern side bordering the Flat Rock Creek Gully.	Section 2.4; 7.5
	9.10 Address the potential bio-certification of the Draft Shoalhaven Comprehensive LEP 2009. Any native vegetation proposed to be removed within the area identified by DECC (see letter dated 27 March 2009 at Attachment 4), needs to be offset in accordance with the principles of 'maintain and improve' environmental outcomes.	N/A
	9.11 Resolve the provision of arterial road access for the proposal and any impacts on threatened species assessed using the 'avoid, mitigate or offset' framework.	Section 7.5; 7.8
	9.12 Outline measure for the conservation of existing wildlife corridor values and/or connective importance of any vegetation on the subject land. Investigate opportunities to conserve or enhance local and regional corridors and important habitats, such as creek lines, in the design of the proposal.	Section 7.5
	9.13 Describe all aquatic environments (watercourse, wetlands) located on or adjacent to the site, and their regional significance.	Section 7.1
	9.14 Predict impact upon aquatic environments on or adjacent to the site (both temporary and	Section 7.1

Issue No.	Key Project-Specific Issue	Relevant Sections of EA
	permanent). Predict any temporary and permanent impacts upon water quality and aquatic threatened species, populations, ecological communities listed under the *Fisheries Management Act 1994* (NSW).	
	9.15 Assess any impacts and address measures and safeguards to mitigate impacts of the proposal on watercourses, associated riparian vegetation, and adjacent aquatic habitats, including SEPP 14 wetlands. Provide full details and widths of proposed riparian zones for Flat Rock Creek Recommended core riparian zones (where applicable) are: 10m (minimum) for any intermittently following 1st order watercourse; 20m for any permanently flowing.	Section 7.1
	9.16 Address impacts on migratory species, RAMSAR wetlands and species listed under Section 18 and 18A of the EPBC Act.	Section 7.5
10	Noise:	
	10.3 Address potential noise impacts (existing and proposed) on the development, particularly from road traffic and aircraft/defence operation, and the proposed Bamarang Power Station Stage 2 (08_0021). Address appropriate mitigation measures to ameliorate any identified noise impact.	Section 7.2
	10.4 Assess the noise targets for internal spaces referenced in *AS2021:2000 – Acoustics – Aircraft Noise Intrusion – Building Siting and Construction (AS2021)* in the assessment of potential noise impacts. The targets can be found at Table 3.3 *Indoor design sound levels for determination of aircraft noise reduction of AS2021.*	Section 7.2
11	Aviation/Defence	
	11.2 Address potential impacts of the proposal on the operations of HMAS Albatross, and consider flight path impacts from military aircraft operations on the proposal.	Section 7.12

1.5.3 EA Exhibition

Part 3A of the EP&A Act makes provision for the public notification and exhibition of the Environmental Assessment Report. Section 75H of the EP&A Act sets out the consultation requirements for applications under Part 3A. Section 75H(s) requires that *"After the environmental assessment has been accepted by the Director-General, the Director-General must, in accordance with any guidelines published by the Minister in the Gazette, make the environmental assessment publicly available for at least 30 days."* Any submissions made in accordance with Section 75H are to be provided to the proponent, and any public authorities the Director-General considers appropriate.

1.6 Purpose and Structure of the Report

This report is an Environmental Assessment (EA) to accompany the Development Application for approval under Part 3A of the EP&A Act a 109 Lot subdivision of Lot 1 DP 1021332 and Part Lot 458 DP 1063107, George Evans Road, Mundamia. This report describes:

- the environmental and cultural attributes of the subject site;
- the proposed development;
- the impacts associated with the development; and
- the mitigation measures that will be employed to minimise those impacts.

The purpose of this EA is to provide independent and accurate information at the appropriate level to the approval agencies and the general public about the nature of the development proposal, its potential impacts and the way in which the project will be managed in order to reduce those impacts.

The structure of the EA is designed for the convenience of the reader. The EA is split into three volumes including:

- Volume 1: Environmental Assessment Report;
- Volume 2: Attachments (1 - 10); and
- Volume 3: Specialist Reports (Appendices 1 – 10).

2 EXISTING ENVIRONMENT

The Shoalhaven region takes in the coast, the fertile plains, the rugged mountain escarpment and the panoramic views of the eastern seaboard. The region contains rivers, coastal lakes, estuaries and over 300,000 hectares of National Parks and State Forests. Nowra and Bomaderry are the major urban areas in the northern part of the region and are located approximately 15km from the coast situated on the southern and northern banks of the Shoalhaven River respectively. Milton and Ulladulla are the major urban areas in the southern part of the region and are located approximately 3.5km from the coast and on the coast respectively.

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. Only Lot 1 and Lot 458 contain relatively intact native vegetation within the study area. Much of the remainder of the area within Mundamia is regenerating to some degree with typical colonizing native species and some weeds. Large areas of exposed soil are present towards the centre of Lot 1, along with numerous vehicle tracks. Two power line easements with associated clearing also occur within the site. The remainder of the chapter discusses the environment attributes of the subject site as described in Section 1.4.

Shoalhaven is a species rich region with varying topography and a complex and diverse range of terrestrial native vegetation communities, covering approximately 80% of that region. The region contains over 70 threatened fauna species and approximately 30 threatened flora species and well as a number of migratory waders and waterbirds. The large amount of intact terrestrial native vegetation within the Shoalhaven region provides vegetated linkages between private land, National Parks and other protected land within the region, which contribute to the ability of terrestrial flora and fauna species to disperse, reproduce, migrate and colonise, throughout the region thereby ensuring long-term viability of native species.

The study area within Mundamia 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. The site occupies a broad ridge top position at an altitude of approximately 40 – 60m Australian Height Datum (AHD). The area is generally flat, apart from substantial excavations made for quarrying and drainage channels, which would appear to direct most surface water to the north. The site appears to be underlain by Nowra Sandstone and the soil material is generally sandy. The area does not contain any exposed rock, although surrounding areas contain substantial sandstone sheets, outcrops and cliffs.

2.1 Topography

The study area lies at an altitude of 40 – 60m Australian Height Datum (AHD). Previous site use as a quarry / gravel pit has reshaped the natural site surface. The site falls to its centre which consists of a flat (slopes <5%) exposed sandstone surface. Drainage is facilitated by a manmade channel that runs north and exits the site under Jonsson Rd.

2.2 Geology

The geology of the area consists of Permian era Nowra Sandstone, comprising quartzose sandstone, minor siltstone and conglomerate beds. Sandstone bedrock may be exposed that could host Aboriginal grinding grooves, and on the steeper areas adjacent northern and eastern margins of the area sandstone rock formations that can host Aboriginal deposits and/or rock art.

2.3 Soil Landscapes

According to Martens' Hydrological Assessment the site's soil profile typically comprises shallow (0 - 0.8m deep) silty sand, silty gravel and gravels over extremely weathered sandstone. A deeper profile up to 2.8m deep is also observed on the site and comprises silty sand over clayey sand and clays. The deeper profile is also underlain by extremely weathered sandstone.

2.4 Vegetation

According to ELA's Flora and Fauna Assessment (Appendix 2) the wider Mundamia urban release area contains four native vegetation communities as indicated in the constraints mapping under Section 2.9 of this report including:

- Scribbly Gum – Blackwood Woodland;
- Grey Gum – Stringybark Forest/Woodland;
- Kunzea Shrubland/Heathland; and
- Paperbark Closed Forest.

As outlined above the majority of the study area has been severely disturbed by the quarry operations and comprises regenerating vegetation, however the less disturbed area in the north and north east contain the Scribbly Gum – Blackwood Woodland community.

A total of 269 flora species were recorded in the Mundamia urban release area by BES (2004a). These species include the threatened Nowra Heath Myrtle *Triplarina nowraensis* and the critically endangered (EPBC Act) Spring Tiny Greenhood *Pterostylis* sp. Flat Rock Creek (then known as *Pterostylis vernalis*) (Figure 2.2). These threatened species were not recorded within the current study area, nor does suitable habitat for these species occur within the current study area.

No threatened flora species were recorded in the current study area by BES (2004a) or during recent targeted surveys by Eco Logical Australia Pty Ltd (ELA). One non-threatened but nationally significant plant, the Nowra Tea-tree *Leptospermum sejunctum*, is known north of the study area from a few individuals (BES 2004a). Several other non-threatened but uncommon species were recorded by BES (2004a): *Acacia hispidula*, *Acacia subtilinervis* and the Jervis Bay Tea-tree *Leptospermum epacridoideum*. These species are associated with heathland or shubland and shallow soils. They were not recorded in the current study area and suitable habitat is not present.

2.5 Surface Water

The closest water bodies to the site are the Shoalhaven River and Flat Rock Creek which are located 580m north and 1.6km west of the site respectively. Furthermore as the site is located on a sandstone escarpment, the relief from the development site to receiving waters is steep. The water from the site would therefore need to be discharged over/through the adjoining properties before either being discharge into the Shoalhaven River to the north or Flat Rock Creek to the east.

2.6 Meteorology

The climate of the Shoalhaven is best described as coastal temperate and is characterised by warm summers and mild winters. Summer mean daily temperatures range between 16.3°C and 25.8°C. Winter mean daily temperatures range between 6.2°C and 15.8°C. The median rainfall for individual months ranges between 37.6mm in August and 88.4mm in January. The annual average rainfall is 1,142.1mm. During the spring and summer months the prevailing winds are easterlies in the afternoon. In the autumn and winter months this pattern changes to westerly and north westerly prevailing winds which are generally strongest in the morning. The average monthly wind speed varies by about 20 per cent throughout the year.

2.7 Flood Risk

Council's records indicate that the subject site is situated in an area that is not prone to flooding and has limited potential for new floodways to develop. The closest point along the Shoalhaven River within the 1 in 100 year flood level is 9m above sea level, the subject land is 70m above sea level. As such a flood impact assessment is not required for this subdivision and the NSW Floodplain Development Manual 2005 is not required to be addressed.

2.8 Climate Change/Sea Level Rise/Coastline Management

NSW Draft Sea Level Rise Policy Statement 2009

The Department of Environment and Climate Change acknowledges that increased sea levels will have significant medium-to long-term social, economic and environmental impacts. This policy statement outlines the Governments objectives and commitments to sea level rise. It outlines the support that the Government will provide to coastal communities and local council to prepare and adapt to rising sea levels. The primary objective of this policy is to minimise the social disruption, economic costs and environmental impacts resulting from long-term sea level rise. To achieve these objectives the NSW Government has set out five (5) principles as outlined below:

1. *Promoting adaptive risk-based management*
2. *Supporting local councils*
3. *Supporting appropriate coastal development*
4. *Community support during emergencies*
5. *Information availability*

It is of the belief that the principles outlined above apply more so to state and local government initiatives in an attempt to promote and enforce development controls and policies that reduce the risks to life and property from coastal hazards and flooding. The subject proposal, although identified as being located in a 'coastal zone' is not directly in risk of sea level rise or flooding. This report has addressed the NSW Coastal Policy 1997 (Section 4.3.7) and SEPP 71 (Section 4.3.4) and as discussed in these sections the site is not subject to coastal ecosystems, nor is it subject to impacts of sea level rise or flooding. Furthermore the proposed development will not cause adverse impacts on coastal processes beyond the property boundary or on public amenity or the environment.

Practical Consideration of Climate Change – Floodplain Risk Management Guideline 2007

Section 2 of the Flood Risk Management Guidelines (*Is Climate Change a Significant Issue for the Location?*) addresses whether certain sites are subject to the effects of climate change in terms of flooding. In this section the following questions are put forth:

1. *Will climate change result in new floodways developing in the key design events?*
2. *Will climate change have significant implications for flood hazard in the study area?*
3. *Will climate change result in a significant increase in the frequency of inundation?*
4. *Will climate change result in a significant increase in frequency of exposure to hazard?*
5. *Will climate change significantly impact upon flood damages?*

As previously discussed above, the subject site is located with a 'coastal zone', however the site is situated in an area that is currently not prone to flooding and has limited potential for new floodways to develop. Although at this point is time the effects of climate change cannot be accurately predicted, previous studies of the site have indicated that it has very limited potential to become a flooding hazard in the near future and thus does not trigger any of the abovementioned criteria within the Flood Risk Management Guidelines.

Coastline Management Manual

As discussed above it is of the belief that the subject site is not subject to coastal hazards or threats such as wave and wind action, coastal erosion, sea level rise and more frequent and intense storms. As such no coastal hazard management measures have been included in the proposal. It has however been acknowledged that the site is subject to other environmental impacts which have been identified along with appropriate mitigation measures in the Flora & Fauna Assessment (Appendix 2) prepared by Martens Consulting Engineers Pty Ltd.

2.9 Land Use

Mundamia is predominantly rural shrub land and environmentally protected land with no current residential or commercially zoned areas. The subject site is currently vacant though is to be rezoned under the Draft LEP 2009 as residential land where this subdivision will be contained within. Other than the university campus and some farm land occupying the area Mundamia does not currently contain a great deal of development or infrastructure.

Some of the vegetation on the land has been cleared or damage at some stage historically or as a result of the previous use of the land as a quarry/gravel pit and regrowth has occurred over most of the land. Some areas remain quite disturbed with many weed species and patches of bare earth are present. An electrical easement runs through the southern end of Lot 1 DP 1021332 in a north west to south east direction.

2.10 Site Analysis

A site analysis has been undertaken for the subject land and the main findings are provided below:

- Mundamia is a small regional suburb, located just south of the Shoalhaven River approximately 4kms west of the Nowra CBD and the Princes Highway and approximately 13km from the coast.
- Lot 1 has an area of 9.459ha and Part Lot 458 has an area of 2.823ha, totaling 12.3ha.
- The property consists of unmanaged native vegetation, which has been partially cleared at some stage historically and has re-grown. The site has not experienced any prior development.
- The study area comprises four (4) native vegetation communities: Scribbly Gum – Blackwood Woodland; Grey Gum – Stringybark Forest/Woodland; Kunzea Shrubland/Heathland; and Paperbark Closed Forest.
- Also within the area are the threatened Nowra Heath Myrtle *Triplarina nowraensis* and the critically endangered (EPBC Act) Spring Tiny Greenhood *Pterostylis* sp. Flat Rock Creek (also known as *Pterostylis vernalis*). These threatened species were not recorded within the current study area, nor does suitable habitat for these species occur within the current study area.
- The subject site lies at an altitude of approximately 60m Australian Height Datum (AHD). Lots 1 and 458 generally slope downwards in a northerly direction at a grade of 1.6%.
- The majority of the site is bound by rural shrub land or farm land with environmentally protection land to the north.
- The closest main water bodies to the site comprise the Shoalhaven River approximately 400m north of the subject site
- The subject site contains an electrical easement that runs along the southern end of Lot 1 in a north west to south east direction.
- The closest hospital is the Shoalhaven District Memorial Hospital, located approximately 3km from the subject site off Scenic Drive and Shoalhaven Street.

The site analysis plan (Attachment 14) has been provided below in Figure 2.1. A collection of photos of the site and a sketch plan showing the proposed lot layout support the site analysis and can be found in Attachment 1 and 2. The relevant constraints mapping for the site has been provided below.

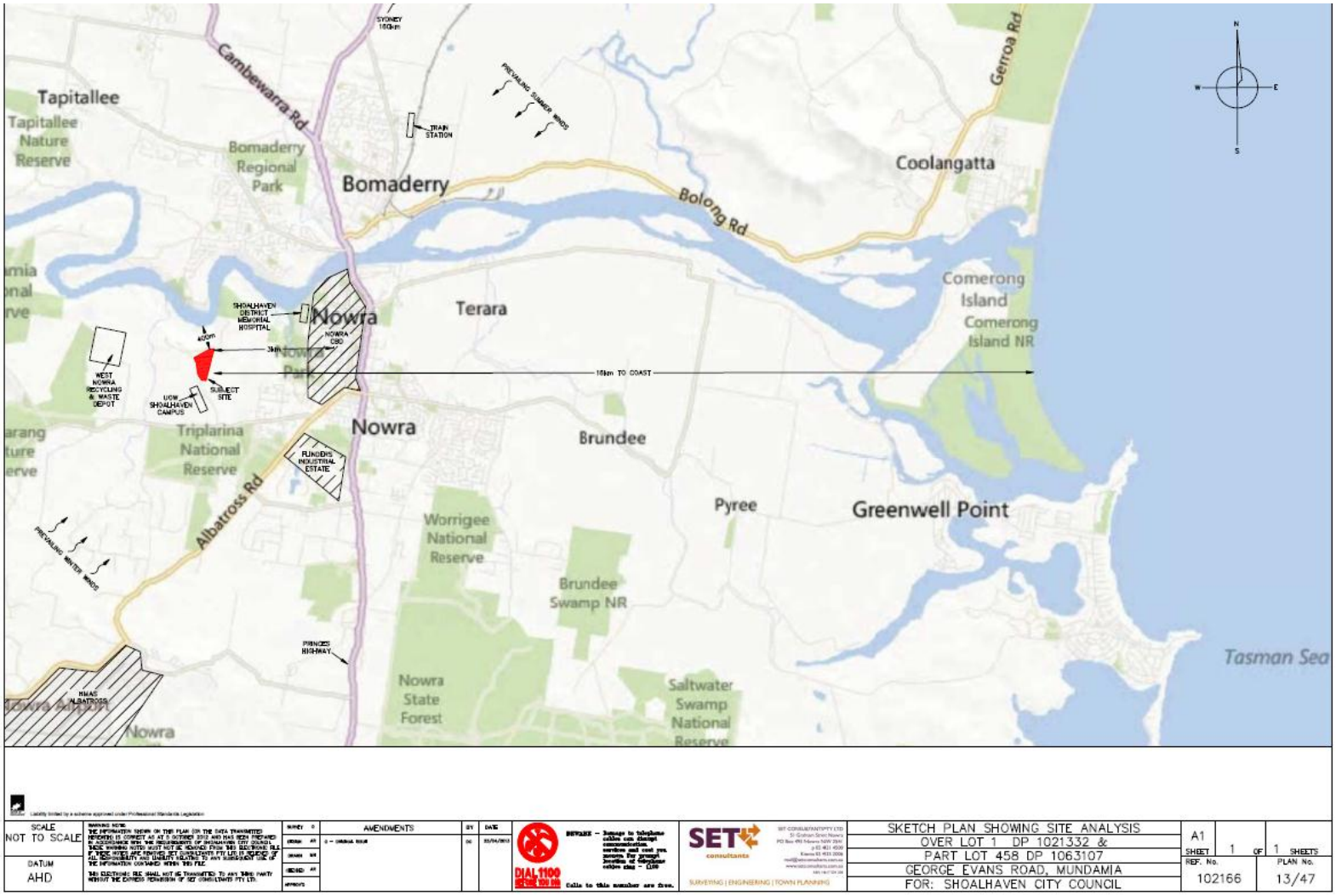

Figure 2.1: Site Analysis

Constraints Mapping

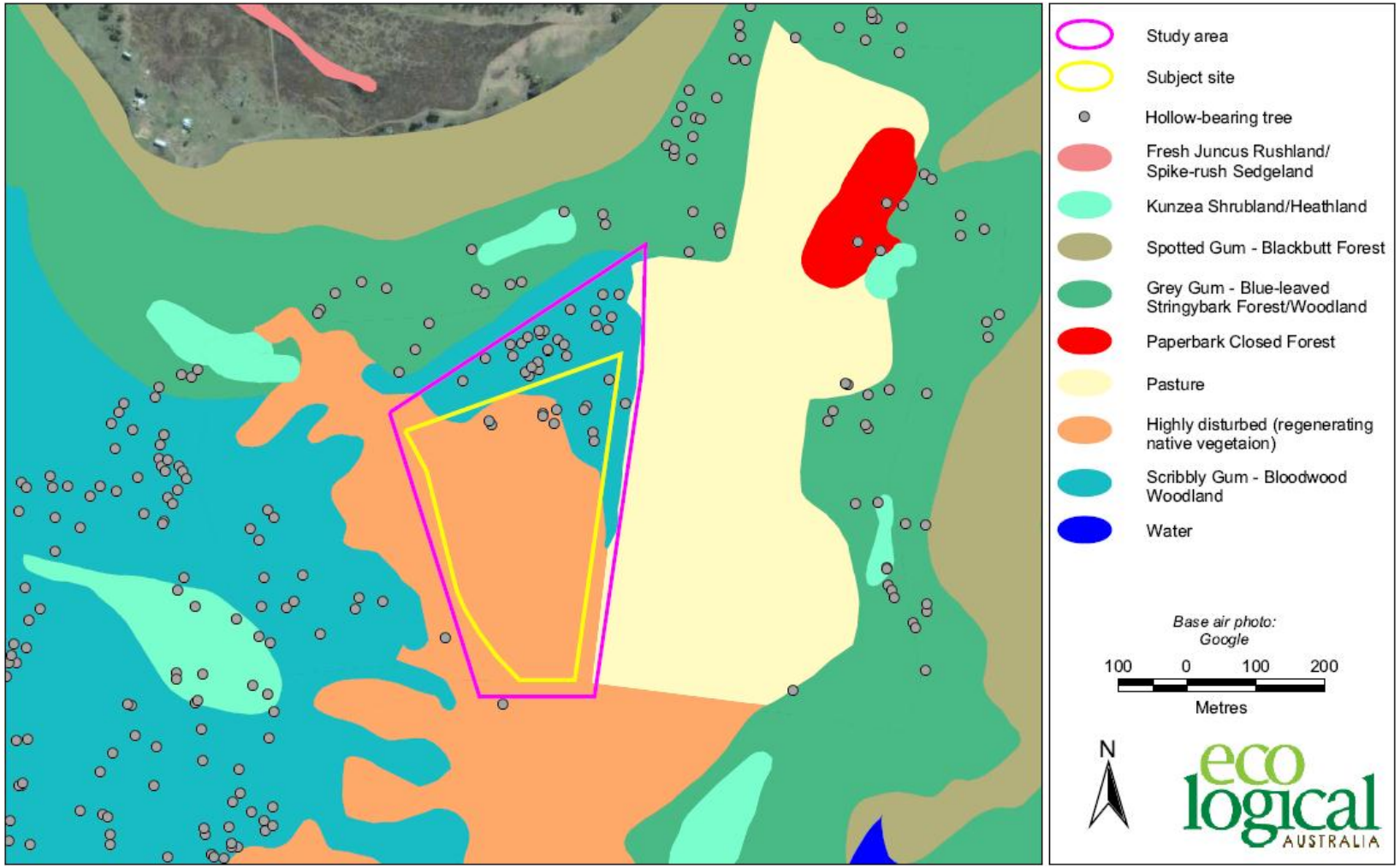

Figure 2.2: Vegetation Map of the Subject Land

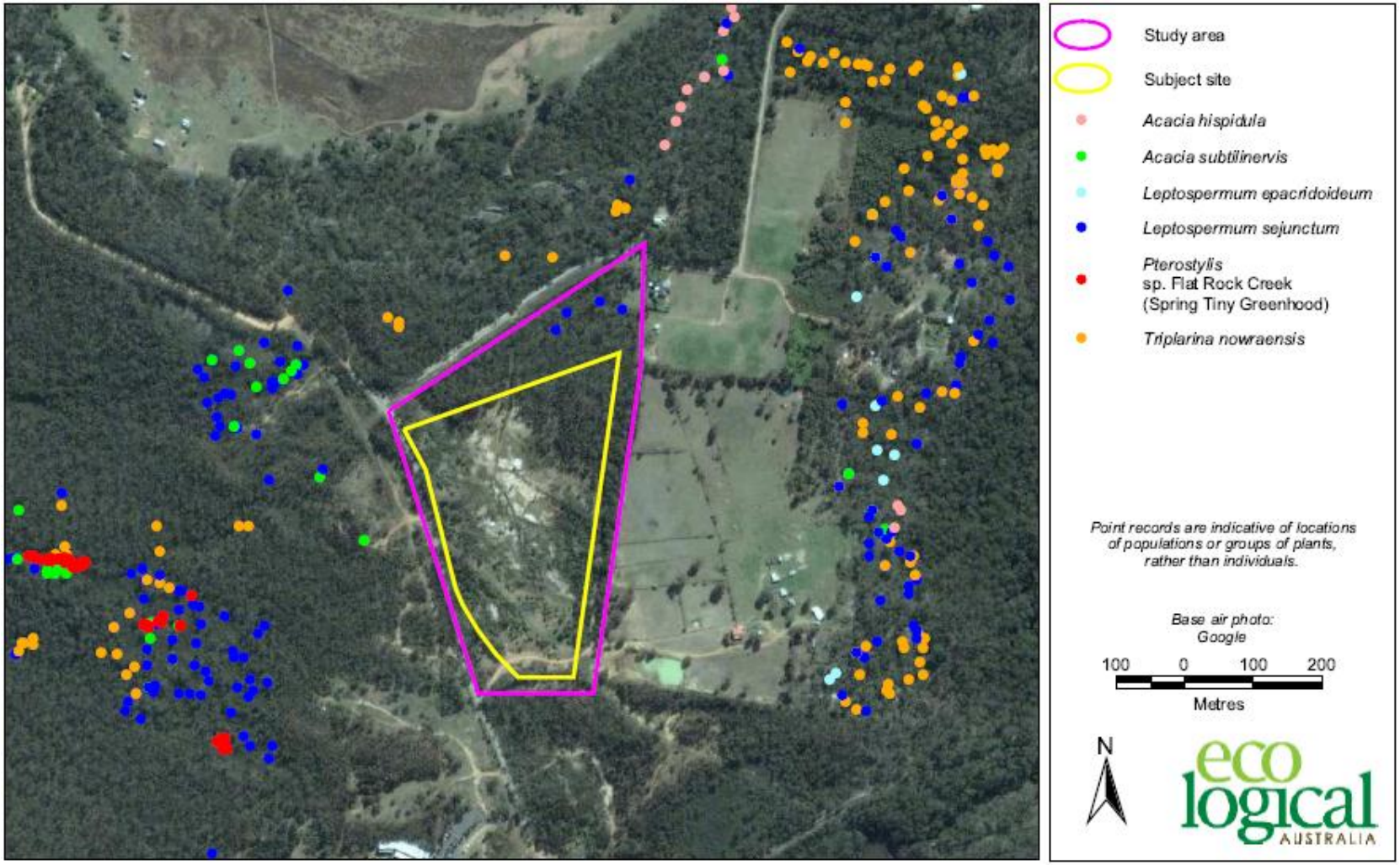

Figure 2.3: Flora species of conservation significance

Figure 2.4: Contamination Testing Plan (Contamination Assessment)

Figure 2.5: Outline of Site fill (Contamination Assessment)

Figure 2.6: Geotechnical Testing and Land Units

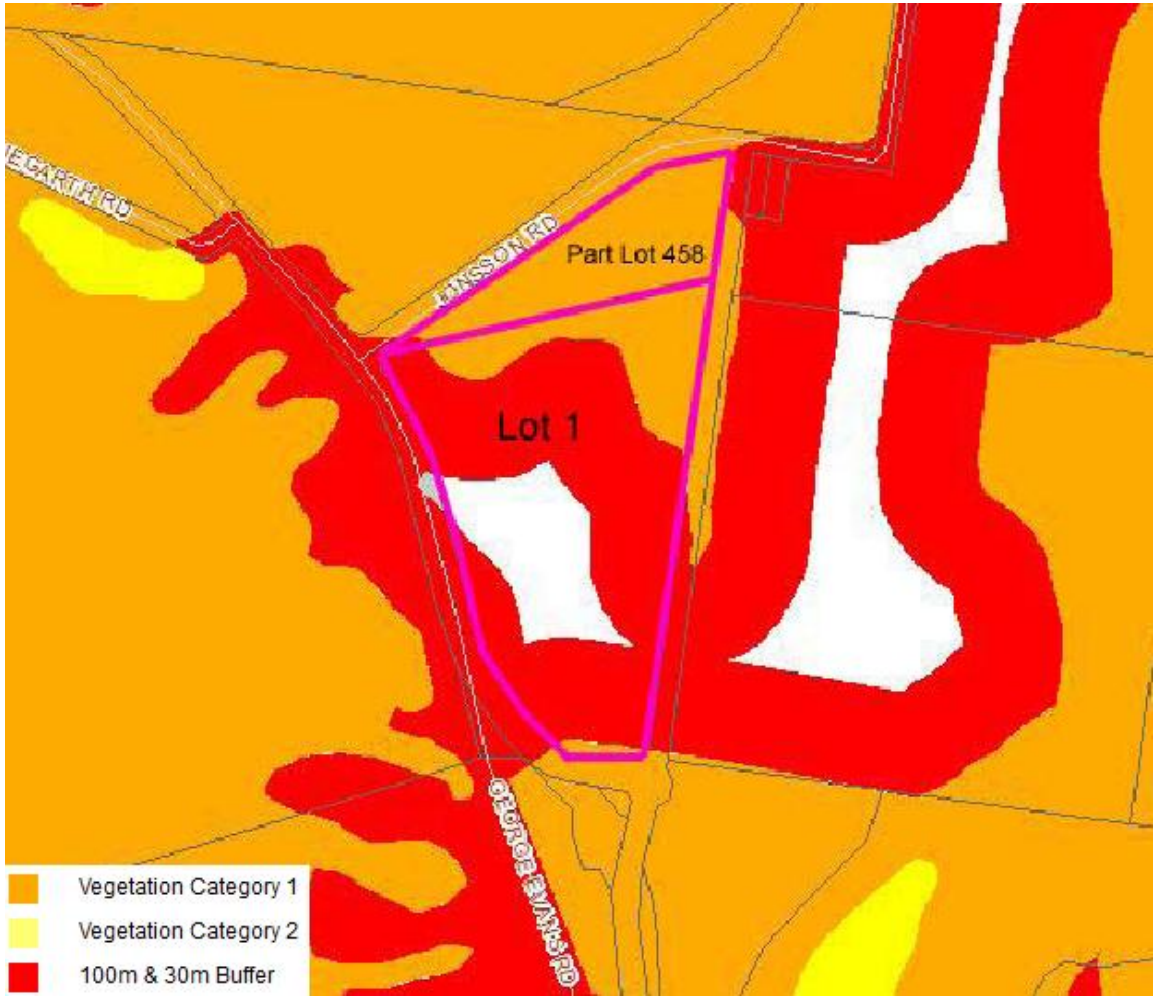

Figure 2.7: Bushfire Prone Land

3 PROJECT DESCRIPTION

3.1 Introduction

The proposal seeks approval to construct a 109 lot subdivision of the subject land, also comprising of a village centre 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.

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.

This development is to be carried out in accordance with the Mundamia Masterplan for the proposed Mundamia residential release area which has been based on a set of principles adopted by Council in August 2007. This is a modest and measured proposal, which takes into consideration the environmental sensitivity of the site.

3.2 Design Concept

This development provides the opportunity for a variety of residential housing to be located in a new urban setting within the Shoalhaven. The site is fortunate to be readily accessible via a good public road network and the local social infrastructure also has the capacity to absorb the potential growth from this project.

The nature of the proposed subdivision is that of small-scale residential release development. The layout has been dictated by the existing road network and utilises these roads, creating extensions and linkages to complete the street network. There has been a number of alternate subdivision layouts considered throughout the design process, these are discussed in section 9.1. The final subdivision layout has been designed to best suit the range of natural site conditions and environmental constraints discussed below.

It is believed that the proposed street layout, residential development boundary and areas of vegetation to be cleared are clearly demonstrated throughout the report and are consistent with the Nowra Bomaderry Structure Plan. This is further discussed in Sections 4.3.3 and 7.5 of the report.

There are a number of site attributes and constraints that have been taken into consideration in the design of the subdivision layout. The main site attributes and constraints are provided below:

<u>Attributes</u>

- The proposed site is located within close proximity to the Shoalhaven University Campus and is only a 5 minute drive from the Nowra CBD.
- The site has no adjoining or nearby existing residents that may be affected by the subdivision or erection of new residential development.
- The subject site and immediate area will be further serviced by future road improvements such as the western bypass of Nowra, a new east-west road connecting Flatrock Road in the west with a northern extension of Cabbage Tree Lane, the new bypass, George Evans Road, and the Nowra CBD. A new east-west road connecting Hillcrest Avenue at Princes Highway with Yalwal Road at Albatross Road

will also be introduced with an upgrade of Yalwal Road to four lanes between Flatrock Road and Albatross Road.

- Local bus services are provided by Nowra Coaches which currently use Yawal Road and George Evans Road to service the university campus.
- The existing road pattern provides a well-defined road network, which is suitable to be extended to facilitate the establishment of the proposed subdivision layout.
- The local area has utility infrastructure, which is suitable to be augmented to accommodate the proposed subdivision.
- The site has a relatively flat topography, which will allow the construction of the proposed subdivision without the need for extensive cut and fill to occur.

Constraints

- The land is regarded as bushfire prone, therefore subdivision design must allow for Asset Protection Zones and adequate access and egress to all developed parts of the lot.
- Geotechnical investigations have determined that a small section of the site is underlaid by various degrees of acid sulfate soil.
- A small electrical easement runs through a section of the site which may need to be rerouted.
- Some threatened species are located within the study area which could potentially be affected. These species include the threatened Nowra Heath Myrtle *Triplarina nowraensis* and the critically endangered (EPBC Act) Spring Tiny Greenhood *Pterostylis* sp. Flat Rock Creek (then known as *Pterostylis vernalis*)

The final design is reflective of the inherent constraints and positive attributes associated with the subject site. The subdivision layout is considerate of the site's environmental sensitivity whilst accommodating the economic reality of the current property market. The design principles incorporate bush fire mitigation measures; and protection of the Endangered Ecological Community. The stormwater concept has been designed in a manner sympathetic to the natural constraints of the site. The relative constraints mapping has been provided in Section 2.9 of this report.

It is further acknowledged that due to the location of the subdivision within a rural area, future dwellings will be encouraged to utilise materials and colours in tones that are complimentary to the natural setting.

3.3 Lot Layout

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. As previously mentioned the proposal also includes a number of allotments that will contain public open space as well a village centre that will include neighbourhood shops, a community centre and a child care centre. The different types of proposed lots are indicated below:

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 3.1 and on the subdivision layout plan (Attachment 1). The proposed subdivision will be constructed and released in eight (8) stages as discussed in Section 3.5. 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 3.1: The proposed subdivision layout

All one hundred and four residential lots will have frontage to the proposed new internal road network with orientation either east-west or north-south. The residential lots have areas ranging in size from 501m^2 (Lots 6-10) to 5690m^2 (Lot 5). Perimeter roads have been utilised in the subdivision design to reduce the APZ requirements on individual lots and improve access for fire fighting purposes. 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.

3.4 Pedestrian, Cycle and Road Access and Circulation Networks

The proposed road network forms the basis for the final lot layout. The existing entry road (George Evans Road) was created with the assumption that development of the subject land would be occurring at some stage in the future.

The proposed subdivision will be accessed via George Evans Road and the unformed Crown Road, which are both 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 and the spine road (unformed crown 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 until the village centre with the remainder of the road reserve being 20m up to Jonsson Road, with George Evans 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 be 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 land set aside for a street carriageway and verge will incorporate the full width from property line to opposite property line. That part of the street reserve between the carriageway and the boundary of adjacent lots (or other limit to street reserve) will accommodate public utilities, footpaths, bioswales, storm water flows, street lighting poles and landscaping. The proposed road reserve and carriageway are as follows:

- The 'unformed Crown Road' (from roundabout to Lot 24) will have a road reserve of 25m and carriageway of 9m, see Section C-C) in Figure 3.2.
- The 'unformed Crown Road' (from north of the village centre to Jonsson Road) will have a road reserve of 20m and carriageway of 9m.
- George Evans Road and Jonsson Road have a road reserve of 22m to 25m (varies) and carriageway of 9m. This allow for on street parking on both sides of a two-way street, and landscaping.
- Road 1 (northern end), Road 2, Road 3, will have a road reserve of 18m road and carriageway of 9m which allows for on street parking to one side of a two-way street with a footpath included in a landscaped verge, see Sections B-B & 0-0 in Figure 3.2.
- Road 4, Road 5, Road 6, and Road 1 (southern end) will have a road reserve of 16m and carriageway of 6m which allows for landscaping, bioswale treatment and bioswale within the verge with no designated footpath or street parking, see Section A-A in Figure 3.2
- Lane 1 will have road reserve of 7m road and carriageway of 4m, which allows for one way vehicular movement with no on street parking or landscaping.

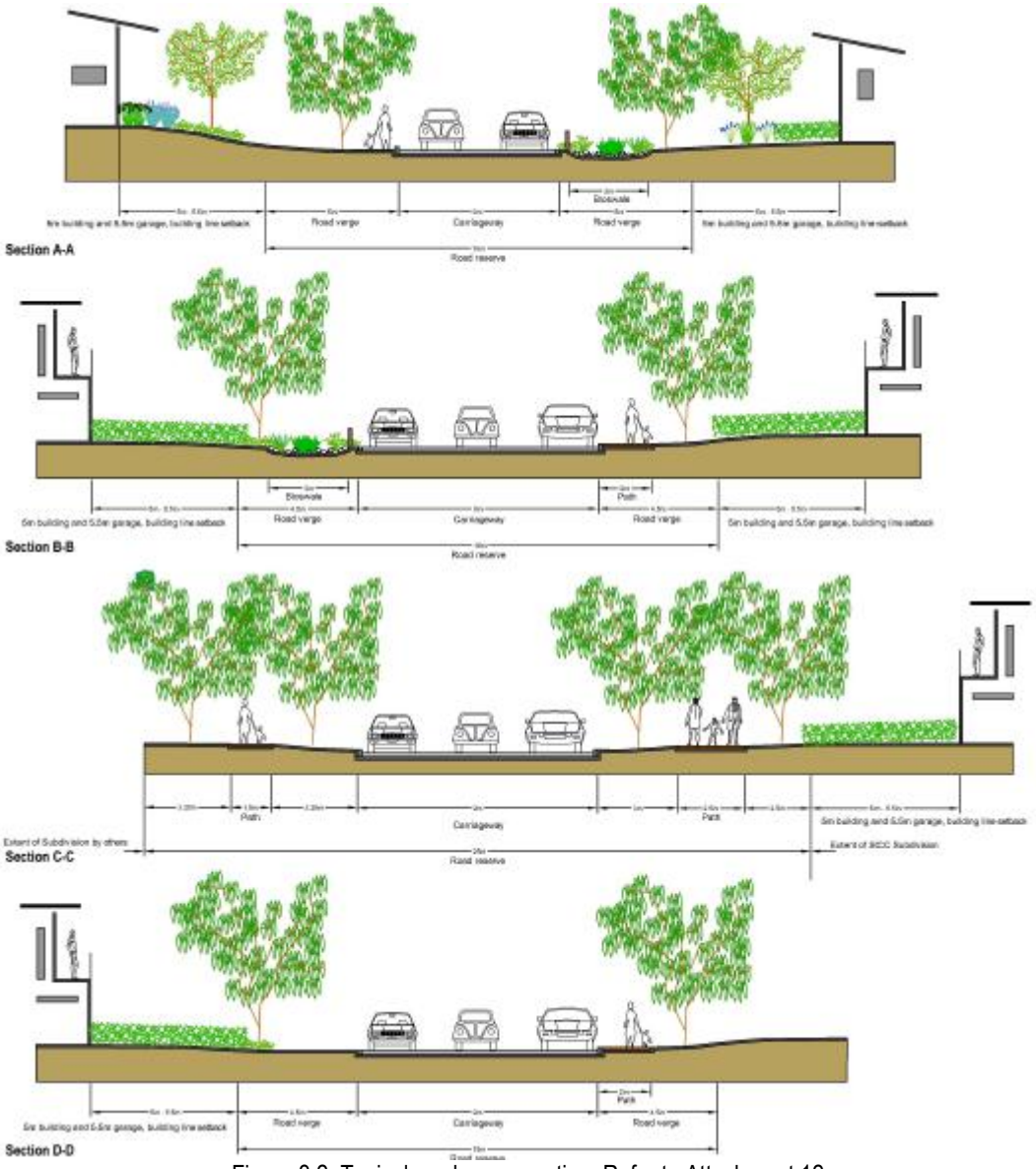

Figure 3.2: Typical road cross-section. Refer to Attachment 12

Pedestrian pathways have been provided on the western side of the 'unformed Crown Road' (from roundabout to Lot 24), on the north side of Road 2 and around the village centre and public open space as well as informal pathways within the public open space areas as indicated on the landscape plan (Attachment 12). There is currently no existing pedestrian movement within the area that may be altered. The pathways proposed allow for future residents within the area to effectively access the village/commercial centre of the release area as well as the main public open space area. There are no formal cycleways along the roads within the existing road network. It is foreseen that due to the low levels of traffic predicted within the proposed new road network cycleways will not be required.

3.5 Staging of Development

The proposed subdivision will be constructed and released in eight (8) stages (Attachment 3) as described below. The timing for the release of the each stage will depend upon market conditions and financing.

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.

3.6 Infrastructure

The development may necessitate the provision of a variety of community infrastructure and essential services. The environmental assessment report considers:

- New infrastructure which is required to complement existing facilities and services;
- Staging of new infrastructure, and augmentation of existing infrastructure is managed in an orderly manner; and
- Scope of any development contributions.

3.6.1 Electricity

The supply authority for electrical power in the Shoalhaven Local Government Area is Integral Energy. At the time of writing this report, Integral Energy was consulted to confirm their network has capacity to support the proposed increase in dwellings as a result of the proposed subdivision.

3.6.2 Sewer and Water

Shoalhaven Water is the service provider for sewer and water within the Mundamia area.

- At the time of writing this report Shoalhaven City Council (Shoalhaven Water) had been consulted to confirm how the proposed water and sewer infrastructure can accommodate the increased number of dwellings resulting from the proposed subdivision.
- Shoalhaven Water has confirmed the inclusion of a pump station to be provided at the north east end of the Mundamia release area to where all sewer water from the area will be pumped to. The Concept Sewer Plan indicates two (2) options for the proposed subdivision.
- A final approach and Sewer Plan will be formulated during the Construction Certificate Stage. The Concept Sewer Plan (Attachment 5) shows that the sewer reticulation has been located and sized to collect residential wastewater from the 105 proposed residential lots within the subdivision.
- Shoalhaven Water also provided correspondence (Attachment 20) on 21/01/13**.** Shoalhaven Water outlines that they are currently reviewing its water supply and sewerage servicing systems. The letter also indicates that the future water supply will be a requirement for the developer and should be provided as part of the water reticulation system for the Mundamia area. Furthermore Shoalhaven Water added that with respect to the sewerage servicing the current Sewerage Servicing Development Servicing Plan (DSP) proposes a new sewage pumping station (SPS) in the north-eastern corner of the URA. This new SPS is intended to serve the lands that can gravitate to it. This work was originally planned for *2016/17.*

Figure 3.3: Proposed Sewerage Services

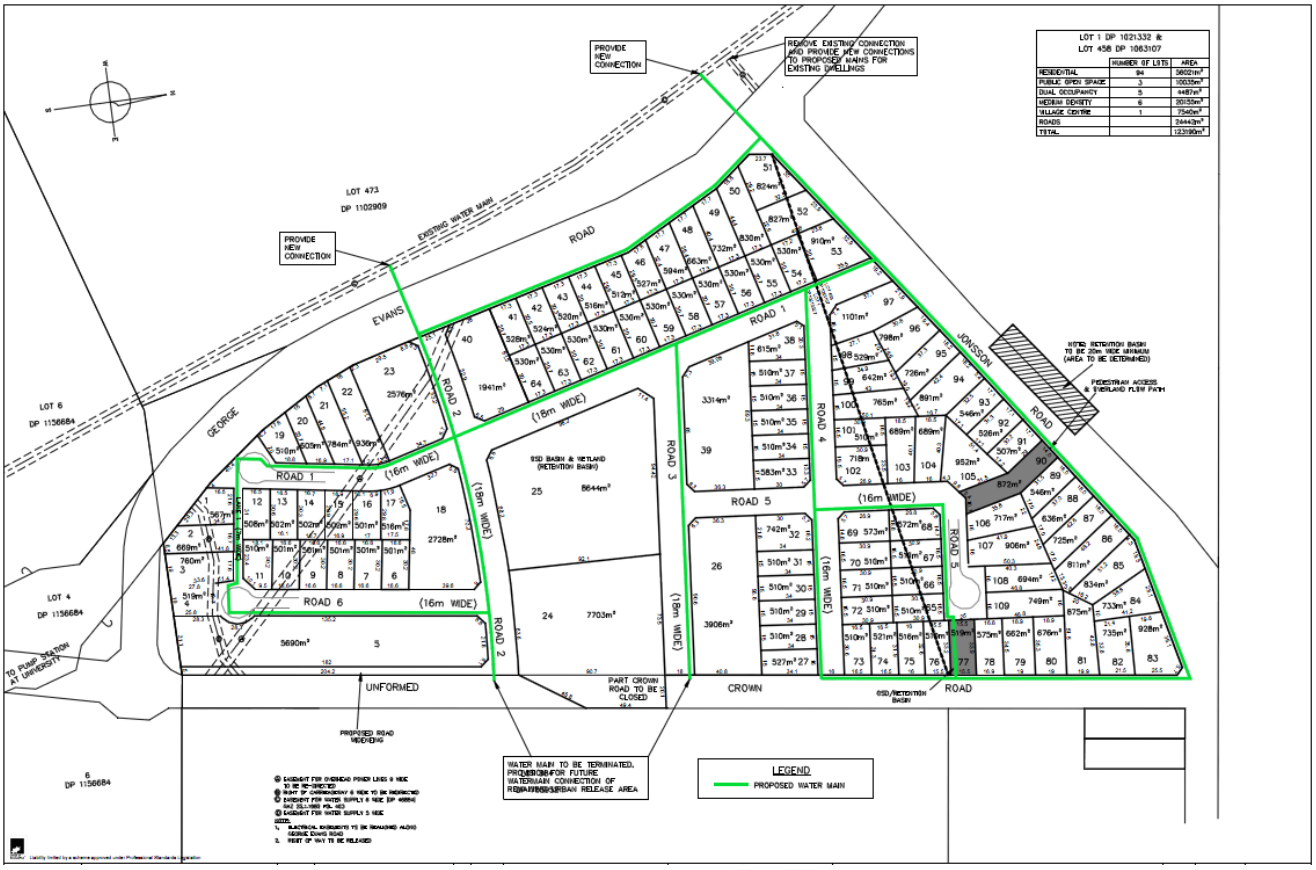

Figure 3.4: Proposed Water Network

3.6.3 Telecommunications

At the time of writing this report, the Forecasting and Area Planning section of Telstra was consulted to confirm that Telstra telecommunications infrastructure could accommodate the proposed increased number of people resulting from the proposed subdivision. Telstra advised that early notification of any proposed development will enable Telstra to deliver services with minimal disruption and enable coordination of trenching with other infrastructure.

3.6.4 Waste

Shoalhaven City Council operates an integrated suite of waste receival facilities across the Shoalhaven local government area for the recovery of resources and the management of wastes. In addition Council provides conventional kerbside collection services for garbage and dry recyclables to the majority of residential communities in the LGA. Through these services Council provides the community with excellent opportunities for the recovery of potentially valuable resources and materials, and for the safe and effective disposal of wastes.

The resource recovery activities at Council facilities are operated through a mix of Council and contractor plant and personnel, while only Council operate the landfill activities. Council is interested in the establishment of a comprehensive resource recovery park at West Nowra in the vicinity of the West Nowra Recycling and Waste Facility, where LGA-wide resource recovery activities might be favourably undertaken at scale and with controlled focus, with a major objective being to reduce the demand for landfill capacity and preserve the value and capacity of the West Nowra Recycling and Waste Facility.

Council provides a weekly kerbside garbage collection service and a fortnightly kerbside commingled recycling service to approximately 94% of the dwellings in the Shoalhaven. The remaining dwellings are serviced on a drop off basis by one of 10 Recycling and Waste Depots located throughout the city area. One depot, West Nowra, contains a licensed putrescible landfill. Two other depots, Huskisson and Sussex Inlet, which contain licensed landfill for the receival of general solid non putrescible waste landfill sites however Sussex ceased landfill operations on 31 August 2008. The depots are equipped with infrastructure to maximise resource recovery (recycled materials bins, scrap steel, concrete and green waste stockpiles, and buy-back centres) and to transfer residual waste to the West Nowra Recycling and Waste Facility for disposal.

The following two forms of kerbside waste collection are provided within the Shoalhaven:

- Recycling - fortnightly kerbside collection of 240 litre mobile recycling bins (MRB). The recyclables are delivered to the current contractor's Material Recovery Facility (MRF).
- Waste - weekly kerbside domestic waste collection from a mixture of 80, 120 and 240 litre sized mobile garbage bins (MGB), and disposed at Council's only licenced solid waste landfill at West Nowra.

It is estimated that the existing waste and recycling management services within the area will be able to service the new release area in Mundamia. A waste management plan is to be prepared for the Construction Certificate before the commencement of Stage 1 of the development. It is forecasted that the waste management plan will link effectively with the existing services described above.

3.6.5 Health

The Mundamia area currently does not have a medical practitioner, however there are several full time practitioners and medical centres throughout the Nowra CBD approximately only 3km from the subject site. The Shoalhaven District Hospital is also located within the CBD and it is foreseen that the proposed increase in population will be easily absorbed by the public health infrastructure.

3.6.6 Education

As previously mentioned the Shoalhaven Campus for the University of Wollongong is located approximately 200m south of the subject site. Currently there are no schools located in the Mundamia area. However, there are educational facilities available throughout the Nowra and Bomaderry areas (including five (5) high schools, seven (7) primary schools and the Nowra TAFE College). Therefore, it is anticipated that any new enrolments from the proposed development can be accommodated within existing local schools.

3.7 The Scale of the Proposed Development

The proposed development will result in the creation of an additional 109 lots in a rural area that is to be rezoned residential under the new Shoalhaven LEP 2009. The subdivision is a small-scale residential release development with lots similar in size to those in nearby residential areas.

The extension of George Evans Road and the unformed Crown Road will complete the existing road network, while the construction of an additional six minor streets will also provide access to the proposed allotments. The introduction of traffic calming devices (landscape treatment) on these upgraded roads will assist in managing driver behaviour in what will essentially be a quiet, low-medium density residential area.

The scale of the development is such that medium density development will be the maximum achievable. All medium density lots are proposed to be located around the village centre and therefore are unlikely to result in problems associated with overshadowing. Solar access provisions will be addressed as part of the BASIX certification for future dwellings.

3.8 Potential Future Development

All future buildings to be developed within the new urban release area will be subject to the new Shoalhaven Development Control Plan (DCP) which will specify controls for development in Mundamia. The proposed size and scale of the allotments have been designed to allow for adequate setbacks and private open space to be achieved on all lots. The built form, buildings envelopes, design quality and safer by design issues are to be addressed at the Development Application stage for the development of these individual lots in accordance with the new DCP. A preliminary assessment of potential building envelopes cannot yet be formulated as the draft DCP is yet to be placed on public exhibition.

3.9 Provision of Public Facilities and Services

The suburb of Mundamia currently has limited public facilities; however, it is located within a 5 minute drive of the Nowra CBD, which contains sufficient public facilities including high schools, hospitals, doctors, specialist services and a police station to cater for the proposed increase in population, associated with the proposal. The Mundamia area does have the Shoalhaven University Campus and the proposal also includes a village centre and public open spaces to cater to new residents of the area.

4 STATUTORY PLANNING

4.1 Commonwealth Legislation

4.1.1 Environmental Protection and Biodiversity Conservation Act, 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* specifies that approval is required from the Commonwealth Minister for the Environment and Heritage for actions that have, will have or are likely to have a significant impact on a matter of "national environmental significance".

Matters of national environmental significance are:

- listed threatened species and communities,
- migratory species protected under international agreements,
- RAMSAR wetlands of international importance,
- the Commonwealth marine environment,
- World Heritage properties,
- National Heritage places, and
- nuclear actions.

Response:

The only matter of national environmental significance for this development is 'listed threatened species and communities'. No threatened ecological communities or migratory species listed under the EPBC Act were identified on or adjacent to the proposal or considered likely to utilise habitats found within the development footprint (Ecological Australia Pty Ltd 2010) (ELA).

SEWPaC has a protected matters search tool (PMST) that assists in identifying MNES that may be in the vicinity of any project. By entering the coordinates for a given project, a report is generated that provides a conservative list of the MNES potentially occurring in the area. A PMST report was run as part of the ELA 2010 Draft FFA. Various flora and fauna surveys including targeted threatened species surveys and surveys for MNES were undertaken by Bushfire Environmental Services (BES) in 2004, (ELA) in 2010 and Shoalhaven City Council/Office of Environment and Heritage in 2011.

The likelihood of presence or absence of matters of NES identified through the PMST and field investigations has been assessed. The following species were identified as either being present in adjacent area or having the potential for onsite occurrence:

- *Pterostylis* sp. Flat Rock Creek (Spring Tiny Greenhood Orchid)
- *Triplarina nowraensis* (Nowra Heath Myrtle)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Pteropus poliocephalus* (Grey-headed Flying-Fox)

The impact the proposal may have on these species has been assessed by Eco Logical in the Flora & Fauna Assessment (Appendix 2). Furthermore a referral decision was received from the Department of Sustainability, Environment, Water, Population and Communities on the 20 August 2012 (Attachment 9). It was concluded that the proposed development was not a controlled action if undertaken in a particular manner. This decision was made under sections 75 and 77A of the *Environment Protection and Biodiversity Conservation Act 1999*

(EPBC Act). The Department of Sustainability, Environment, Water, Population and Communities proposed the following measures to be taken to avoid significant impacts on:

- Listed threatened species and communities (sections 18 & 18A).
    1. A stormwater recharge infiltration system (SRIS) must be designed and implemented as part of the construction phase of the development.

       The SRIS must supply supplementary recharge at rates detailed in Table 6 of the report *"Hydrological Assessment Proposed Subdivision, Mundamia Release Area, Mundamia NSW",* June 2011.

    2. Design of infrastructure including road and other structures must ensure that they do not impede, redirect or otherwise modify current off-site groundwater drainage patterns as described in *"Hydrological Assessment: Proposed Subdivision, Mundamia Release Area, Mundamia NSW",* June 2011.

4.2 State Legislation

4.2.1 Environmental Planning and Assessment Act 1979

The objects of this Act are:

(a) to encourage:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,
(ii) the promotion and co-ordination of the orderly and economic use and development of land,
(iii) the protection, provision and co-ordination of communication and utility services,
(iv) the provision of land for public purposes,
(v) the provision and co-ordination of community services and facilities, and
(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and
(vii) ecologically sustainable development, and
(viii) the provision and maintenance of affordable housing, and

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

Response:

The development of the Mundamia areas has been formulating gradually since before the introduction of the Mundamia Masterplan in 2008. This Masterplan was assembled to outline a number of principles and controls to guide development in the area in a way that would provide a residential living area of unique character and ambiance while addressing the natural constraints of the area. The Nowra Bomaderry Structure Plan was also

put into effect with a purpose to provide a framework for the integrated development of the Nowra Bomaderry area. Looking at the implications of the ongoing growth of the urban area in the City of Shoalhaven, the plan assesses the need to balance this role with the need to conserve the significant environmental attributes of the area. For this proposal specifically a number of studies have been carried out as indicated in the appendix of this report. These studies have addressed the natural constraints of the subject land in relation to the proposed development and indicated the potential impacts on the site and mitigation measures to be enforced to reduce these impacts. The previous studies undertaken for the area along with the current information provided ensures this proposal can be carried out with the proper management of the social and economic welfare of the community with a better environment at outcome. Furthermore the proposal has been processed through the relevant levels of government and government agencies with sufficient public involvement and participation. As such the proposed development is believed to adequately achieve and address the objects of the Environmental Planning and Assessment Act 1979.

4.2.2 Threatened Species Conservation Act 1995

The New South Wales *Environmental Planning and Assessment Act 1979*, as amended by the *Threatened Species Conservation (TSC) Act 1995* and *Threatened Species Conservation Amendment Act 2002*, requires that various factors be taken into account in deciding whether a proposed action, development or activity is likely to have a significant effect on threatened species, populations or communities, or their habitats and, hence, whether the preparation of a Species Impact Statement (SIS) is warranted.

The TSC Assessment Act also specifies that any assessment guidelines issued by the Minister for the Environment be taken into account when assessing the impacts to threatened species, populations, or ecological communities, or their habitats a rising from a development proposal assessed under Part 3A of the *Environmental Planning and Assessment Act 1979*. Referred to as the Assessment of Significance - *Threatened Species Assessment Guidelines (2008)*, they clarify technical terms and assist in the interpretation and application of the various factors.

These guidelines have been prepared to help applicants/proponents of a development or activity with interpreting and applying the factors of assessment. The aim of the guidelines is to help ensure that a consistent and systematic approach is taken when determining whether an action, development or activity is likely to significantly affect threatened species, populations or ecological communities, or their habitats either directly or indirectly.

Response:

The assessment of significance (seven part test) set out under Section 5A of the EPA Act 1979 has been applied, below, to assist in determining whether the development of the proposed subdivision is likely to have a significant effect on species, populations and communities (and their habitats) listed under the TSC Act.

A Flora and Fauna Assessment Report has been prepared by Eco Logical Pty Ltd and Associates (Appendix 2) which addresses the extent, magnitude and significance of the impacts of the proposal on threatened species, populations and ecological communities listed on the *TSC Act* in relation to the conservation importance of the habitats, populations and individuals likely to be affected by the proposal.

The Assessment of Significance (7-part test) is applied to species, populations and ecological communities listed on Schedules 1, 1A and 2 of the TSC Act and Schedules 4, 4A and 5 of the Fisheries Management Act. The assessment sets out 7 factors, which when considered, allow proponents to undertake a qualitative

analysis of the likely impacts of an action and to determine whether further assessment is required via a Species Impact Statement (SIS). The results of the 7-part test are shown in Appendix E of the Flora and Fauna Assessment (Appendix 2). The Threatened species, populations and ecological communities which may be directly or indirectly affected by the current proposal include:

- *Pterostylis vernalis* (Spring Tiny Orchid)
- *Triplarina nowraenis* (Nowra Heath Myrtle)
- Yellow-bellied Glider *(Petaurus australis)*
- Glossy-black Cockatoo (*Calyptorhynchus lathami*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Powerful Owl (*Ninox strenua*)
- Square-tailed Kite (*Iophoictinia isura*)
- Grey-headed flying-fox (Pteropus poliocephalus)
- Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*)
- Little Bentwing Bat (*Miniopterus australis*)
- East Coast Freetail Bat *(Mormopterus norfolkensis)*
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Greater Broadnosed Bat (*Scoteanax rueppellii*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Rosenberg's Goanna (*Varanus rosenbergi)*

The proposal is located primarily in an area of severe historic disturbances, which greatly limits the value of the subject site for threatened flora and fauna species. The 7-part test conducted by Eco Logical concluded that the direct impacts of the proposal on threatened species are minimal. No endangered populations or ecological communities occur in or near the study area. However, beyond the subject site are species and habitats of considerable conservation value, primarily for the threatened plants *Triplarina nowraensis* and *Pterostylis vernalia,* which are susceptible to indirect impact from the proposal.

Eco Logical advises that the indirect impacts need to be addressed and controlled, with additional protection given to nearby area containing the species or suitable habitat for the species. Furthermore Eco Logical concluded that provided that measures to mitigate and manage the indirect impacts of the proposal area applied it is unlikely that the proposal will result in significant impact to any threatened species and a Species Impact Statement would therefore not be required for the proposal.

Conclusion, TSC Act

Eco Logical concluded that the development of the proposed subdivision at Mundamia is not likely to have a significant effect on threatened species, endangered populations, ecological communities, or their habitats, provided that effective measures are undertaken to control, monitor and manage indirect impacts of the proposal on nearby habitats of conservation value.

Following consideration of the administrative guidelines for determining significance under the EPBC Act it is concluded that an unmitigated proposal could have a significant impact on the Spring Tiny Orchid *Pterostylis* sp. Flat Roack Creek and the Nowra Myrtle *Triplarina nowraensis,* and a referral to the Commonwealth Environment Minister is recommended (Eco Logical 2012).

4.2.3 Native Vegetation Act 2003

The objectives of this Act are:

(a) To provide for, encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State, and
(b) To prevent broadscale clearing unless it improves or maintains environmental outcomes, and
(c) To protect native vegetation of high conservation value having regard to its contribution to such matters as water quality, biodiversity, or the prevention of salinity or land degradation, and
(d) To improve the condition of existing native vegetation, particularly where it has high conservation value, and
(e) To encourage the revegetation of land, and the rehabilitation of land, with appropriate native vegetation, in accordance, with the principles of ecologically sustainable development.

Response:

According to Schedule 1 (Land excluded from operation of Act) Part 3 (Urban areas) Clause 14 of the Act land within a zone designated "residential" are not covered under the Native Vegetation Act 2003. Clause 14 states:

14. Land within a zone designated "residential" (but not "rural-residential"), "village", "township", "industrial" or "business" under an environmental planning instrument or, having regard to the purpose of the zone, having the substantial character of a zone so designated, not being land to which a property vegetation plan applies.

The subject land is currently 1(d) General Rural under the Shoalhaven LEP 1985. However this application is being assessed under the new Shoalhaven LEP 2009 in which the subject is to be rezoned to R1 General Residential. Therefore according to the proposed future zoning the Act does not apply to the subject land.

4.2.4 Mining Act 1998 No. 29

The objects of this Act are to encourage and facilitate the discovery and development of mineral resources in New South Wales, having regard to the need to encourage ecologically sustainable development, and in particular:

a) to recognise and foster the significant social and economic benefits to New South Wales that result from the efficient development of mineral resources, and
b) to provide an integrated framework for the effective regulation of authorisations for prospecting and mining operations, and
c) to provide a framework for compensation to landholders for loss or damage resulting from such operations, and
d) to ensure an appropriate return to the State from mineral resources, and
e) to require the payment of security to provide for the rehabilitation of mine sites, and
f) to ensure effective rehabilitation of disturbed land and water, and
g) to ensure mineral resources are identified and developed in ways that minimise impacts on the environment.

Section 369 Notification areas states that the Dams Safety Committee may, by order published in the Gazette in relation to a prescribed dam, declare that the land described in the order, including land under the dam, is the notification area for the dam. A notification area is an area which underlies or surrounds a prescribed dam and in relation to which the Dams Safety Committee is required by this Act to be notified of certain proposals to grant assessment leases or mining leases.

Response:

Flat Rock Creek Dam is a prescribed dam under the Dams Safety Act 1978, the Dams Safety Committee pursuant to Section 369 of the Mining Act 1992 declared a notification area around the Dam in October 1999 (Gazettal No. 120).

The subject site falls within the prescribed notification area (Attachment 13). However, the proposal is for the subdivision of the subject land and does not seek approval for an assessment lease or mining lease under the Mining Act, therefore the Dams Safety Committee does not require notification under Section 369 of the Mining Act. Attachment 13 provides a plan for the Flat Rock Creek Notification Area.

4.2.5 Rural Fire Act 1997

The objects of this Act are to provide:

(a) for the prevention, mitigation and suppression of bush and other fires in local government areas (or parts of areas) and other parts of the State constituted as rural fire districts, and
(b) for the co-ordination of bush fire fighting and bush fire prevention throughout the State, and
(c) for the protection of persons from injury or death, and property from damage, arising from fires, and
(d) for the protection of the environment by requiring certain activities referred to in paragraphs (a)–(c) to be carried out having regard to the principles of ecologically sustainable development described in section 6 (2) of the Protection of the Environment Administration Act 1991.

Clause 100B Bush fire safety authorities

(1) The Commissioner may issue a bush fire safety authority for:

(a) a subdivision of bush fire prone land that could lawfully be used for residential or rural residential purposes, or

(b) development of bush fire prone land for a special fire protection purpose.

Response:

The subject site is identified as being bush fire prone in accordance with mapping prepared by Shoalhaven Council in conjunction with the Rural Fire Service. The subdivision if not for section 75U of the EP&A Act 1979 would require a Section 100b Bushfire Safety Authority. Regardless of this, a Bushfire Protection Assessment (Appendix 3) has been prepared by SET Consultants Pty Ltd (2012) in accordance with DGRs. The Bushfire Protection Assessment addresses the threat of bushfire and to address the requirements of Planning for Bushfire Protection guidelines 2006.

4.3 State Environmental Planning Policies

4.3.1 State Environmental Planning Policy 2005 (Major Projects)

The aims of this Policy are as follows:

(a) *to identify development to which the development assessment and approval process under Part 3A of the Act applies,*
(b) *to identify any such development that is a critical infrastructure project for the purposes of Part 3A of the Act,*
(c) *to facilitate the development, redevelopment or protection of important urban, coastal and regional sites of economic, environmental or social significance to the State so as to facilitate the orderly use, development or conservation of those State significant sites for the benefit of the State,*
(d) *to facilitate service delivery outcomes for a range of public services and to provide for the development of major sites for a public purpose or redevelopment of major sites no longer appropriate or suitable for public purposes,*
(e) *to rationalise and clarify the provisions making the Minister the approval authority for development and sites of State significance, and to keep those provisions under review so that the approval process is devolved to councils when State planning objectives have been achieved.*

Response:

The whole of the subject property falls within the *'coastal area' (SEPP (Major Projects) 2005 Schedule 2 Clause 1)* and the *'Coastal Zone;* as defined in the *Coastal Protection Act 1979 (CP Act)*, within the Shoalhaven Local Government Area.

Schedule 2, Clause 1 of SEPP (Major Projects) 2005 states that the following sites in the coastal areas are projects to which Part 3A applies:

(i) subdivision of land in a residential zone into more than 25 lots or in a rural/residential zone into more than 5 lots, but in the case of the metropolitan coastal zone only if the land is wholly or partly within a sensitive coastal location.

In summary, the proposed project falls within Schedule 2 as it involves subdivision to create greater than 25 lots in a residential zone, is located wholly within the coastal area. As a result, this Environmental Assessment Report has been prepared to address the Director General Requirements as discussed in Section 1.5.2.

4.3.2 State Environmental Planning Policy (Infrastructure) 2007

The State Environmental Planning Policy (Infrastructure) 2007 is to facilitate the effective delivery of infrastructure across the State by:

(a) *improving regulatory certainty and efficiency through a consistent planning regime for infrastructure and the provision of services, and*
(b) *providing greater flexibility in the location of infrastructure and service facilities, and*
(c) *allowing for the efficient development, redevelopment or disposal of surplus government owned land, and*
(d) *identifying the environmental assessment category into which different types of infrastructure and services development fall (including identifying certain development of minimal environmental impact as exempt development), and*
(e) *identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure development, and*
(f) *providing for consultation with relevant public authorities about certain development during the assessment process or prior to development commencing.*

Division 17 (Roads and traffic) clause 104 (Traffic-generating development)

(1) This clause applies to development specified in Column 1 of the Table to Schedule 3 that involves:

(a) new premises of the relevant size or capacity, or
(b) an enlargement or extension of existing premises, being an alteration or addition of the relevant size or capacity.

*(2) In this clause, **relevant size or capacity** means:*

(a) in relation to development on a site that has direct vehicular or pedestrian access to any road—the size or capacity specified opposite that development in Column 2 of the Table to Schedule 3, or
(b) in relation to development on a site that has direct vehicular or pedestrian access to a classified road or to a road that connects to a classified road where the access (measured along the alignment of the connecting road) is within 90m of the connection—the size or capacity specified opposite that development in Column 3 of the Table to Schedule 3.

Response:

The proposed development is for a 109 lot subdivision, which is less than the requirements provided in Column 2 (size or capacity) Table to Schedule 3 (*200 or more allotments (where the subdivision includes the opening of a public road*). However the proposal also includes the construction of 'shops and commercial premises', and given this area is greater than 4000m^2, the proposal therefore requires referral to the RTA and a Traffic Impact Study (Appendix 4) has been carried out for the development. The aim of this assessment is to:

- Investigate the existing traffic conditions including current traffic volumes, road widths, and posted speed limit in the vicinity of the proposed development.
- Assess the intersection and traffic requirements for the development.
- Investigate the potential impact the proposed development is likely to have on the existing traffic conditions and recommend methods to minimise that impact if required.

The results and outcomes of the study are discussed in section 7.9.

4.3.3 State Environmental Planning Policy 55 – Remediation of Land

The objectives of this Policy are as follows:

(1) The object of this Policy is to provide for a Statewide planning approach to the remediation of contaminated land.

(2) In particular, this Policy aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment:

(a) By specifying when consent is required, and when it is not required, for a remediation work, and
(b) By specifying certain considerations that are relevant in rezoning land and in determining development applications in general and development applications for consent to carry out a remediation work in particular, and
(c) By requiring that all remediation work meet certain standards and notification requirements.

Response:

Although the subject site has not been previously developed, quarrying activities have been carried out within the site as well as some land fill occurring on site causing potential contamination. As such Martens Consulting Engineers Pty Ltd were engaged to carry out a Contamination Assessment (Appendix 7) and Remedial Action Plan (Appendix 11) which addressed the *Managing Land Contamination – Planning Guidelines SEPP 55 – Remediation of Land.*

Stage 1 – Preliminary Investigation: A preliminary assessment was carried out to identify any past or present potentially contaminating activities and provide a preliminary assessment of any site contamination. A summary of the site history is as follows:

- Site's primary use has been as a quarry / gravel pit which included the use of associated machinery (mobile processing plant, excavators *etc)*.
- Aerial photography indicated that the quarry was established by 1961 and extents have generally remained unchanged.
- Shoalhaven City Council records show that subdivision of Lot 458, DP1063107 (2002) and subdivision of Lot 1, DP1021332 (2009) occurred.
- Register of notices issued under the Contaminated Land Management Act (1997) or the Environmentally Hazardous Chemicals Act (1985) confirmed the site was not subject to an investigation or remediation order.

Martens Contaminations Assessment identified a number of areas of environmental concern (AEC and associated chemicals of concern (COC) as listed in the table below.

AEC	Primary Use	Potential for contamination	COC	Contamination Likihood
(A) Footprint of former quarry/ gravel pit	Quarry / gravel pit	Use as a quarry including the use of heavy machinery during quarry operation	Heavy metals, TRH, BTEX, PAH	Low
(B) Fill (entire site)	Fill used across the site, predominantly to the south	Fill of unknown origin and quality potentially contaminated.	Heavy metals, TRH, BTEX, PAH,PCH, OC/OP pesticides, phenols, asbestos	Medium - High
(C) Constructed drainage channel	Manmade drainage channel to facilitate site drainage	No details regarding construction and or machinery used to construct	Heavy metals, TRH, BTEX, PAH	Low

Stage 2 – Detailed Investigation: Further investigation was carried out as the land was previously discovered to be contaminated. Soils were sampled concurrent with geotechnical investigation on 19-20 September 2012. Laboratory analysis was carried out by Envirolab Pty Ltd, a National Association of Testing Authorities (NATA) accredited laboratory. 33 primary soil samples were selected for a suite of laboratory analysis based on COC. Three fibrous material samples, two trip blanks and two trip spikes were also analysed. Chemical analysis of soil samples are compared to investigation levels for residential land use based on proposed site rezoning.

Subsurface investigations confirmed the presents of fill on site to a depth of 2.3 mbgl. Identified inclusions in fill include:

- Sandstone cobble and boulders
- Bricks
- Concrete slabs
- Steel bars and reinforcement
- Treated pine
- Plastics
- Glass

Additionally, three pieces of fibrous sheeting were found at various investigation points with in the fill areas at a depth range of 0.1-1.1 mbgl. These were sent to the laboratory to test for the presence of asbestos.

Soil analytical laboratory results from the investigations were compared against adopted soil investigation levels and are summarised below:

- All analyses for BTEX compounds were below LOR.
- All analyses for TRH (C10-C–36) were below LOR or below adopted HIL.
- Benzo(a)pyrene concentrations exceeding adopted HIL criteria at 2863/103/1.2 (4.7 mg/kg) and 2863/138/0.5 (2.0 mg/kg).
- Total PAH exceded adoptied HIL in 2863/103/1.2 (53.7 mg/kg) and 2863/138/0.5 (25.2 mg/kg). PAH concentrations from remaining samples were below adopted HIL.
- Lead concentrations exceeded adopted HIL criteria at 2863/105/0.2 (310 mg/kg). Remaining sample heavy metal concentrations were below adopted HIL.
- Samples analysed for OCP/OPP, PCB, total phenols and asbestos in soil were at concentration below LOR and HIL.

Three fibrous material samples analysed all returned positive for asbestos. Samples were collected from TP103 and TP104.

Site testing to date indicates that site contamination is confined to areas identified as fill. Samples with contamination levels above HIL were taken from a depth range of 0.2 - 2.2 mbgl and fibre sheeting was sampled from a depth range of 0.1 – 1.2 indicating that potential contamination exists throughout the entire fill profile.

Martens assessment recommended a remediation action plan (RAP) is to be prepared for the site to assess options and make recommendations for the site's remediation. Further testing may be required to fully delineate the extent of site filling and to assess the possibility of contamination of observed groundwater. Issues of fill extend and groundwater issues may be dealt with by the RAP. Waste classification of any material to be removed from site would be required.

Stage 3 – Remedial Action Plan: A remedial action plan (Appendix 11) has been formulated with the laboratory data to be reviewed and assessed by applying data validation guidelines. The data will be compared to the remediation criteria. The site validation report will be prepared at the completion of remediation works and will form Stage 4 of site investigation process.

4.3.4 State Environmental Planning Policy 71 – Coastal Protection

The subject site is not located within a coastal area and does not contain any marine or coastal ecosystems or species. However given the site is within close proximity to the Shoalhaven River (400m) and within the 'Coastal Zone' SEPP 71 has been addressed.

This policy aims to:

a) *To protect and manage the natural, cultural, recreational and economic attributes of the New South Wales coast.*

The subject site is located approximately 400m south of the Shoalhaven River. The area between the site and the river is to be zoned E3 Environmental Management under the Shoalhaven Draft LEP 2009. The proposed subdivision ends at Jonsson Road with no further future development to be constructed past this point within the E3 zone. Access to the subdivision is via George Evans Road with all lots accessed via the proposed internal circular roads. Therefore there will be no dramatic increase in pedestrian or vehicle movements within the E3 zone towards the river.

b) *To protect and improve existing public access to and along coastal foreshores to the extent that this is compatible with the natural attributes of the coastal foreshore.*

The subject site is not located within the proximity of a public foreshore area. The area between the site and the Shoalhaven River is privately owned land and there is no capability to improve or create new opportunities for public access to the river.

c) *To ensure that new opportunities for public access to and along coastal foreshores are identified and realized to the extent that this is compatible with the natural attributes of the coastal foreshore.*

See above response (part b)

d) *To protect and preserve Aboriginal cultural heritage, and Aboriginal places, values, customs, beliefs and traditional knowledge.*

An Aboriginal Heritage Assessment (Appendix 5) has been conducted by Navin Officer Heritage Consultants and are discussed in Section 7.4.

e) *To ensure that the visual amenity of the coast is protected.*

As outlined above the subject site is not located within a coastal area. The proposed subdivision however will still not be visible from the river or from areas on the northern side of the river.

f) *To protect and preserve beach environments and beach amenity*

Given the location of the site there is no beach environment. However the surrounding environment and amenity of the site will not be adversely affected as a result of the proposed subdivision.

g) *To protect and preserve native coastal vegetation.*

Mitigation techniques have been imposed so as to ensure the protection of native vegetation associated with the surrounding native vegetation.

h) To protect and preserve the marine environment of New South Wales.

The proposal will not have a negative impact on any marine environments.

i) To protect and preserve rock platforms

There are no rock platforms in the vicinity of the subject site.

j) To manage the coastal zone in accordance with the principles of ecologically sustainable development.

Ecologically sustainable development is development, which aims to meet the needs of today, while conserving our ecosystems for the benefit of future generations. ESD principles have been considered throughout the planning and design of this proposal. As a result the proposed subdivision was assessed against social, economic and environmental factors to ensure the proposal satisfied the ESD principles. The proposal was developed to minimise negative impacts and maximise benefits to the local community and give due consideration to the environment. Eco Logical Australia have outlined particular mitigation measures in their Flora & Fauna Assessment (Appendix 2) in accordance with the principles of ESD. These measures will ensure that the zone will be managed effectively in accordance with the principles of ecologically sustainable development.

k) To ensure that the type, bulk, scale and size of the development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area.

The local area is currently comprised of primarily rural land with no other residential or commercial developments within the suburb of Mundamia. With the rezoning of a large portion of Mundamia to R1 (General Residential) under the Shoalhaven Draft LEP 2009, and the objectives of the Mundamia Masterplan 2008, the proposed development is an appropriate addition to the area. The introduction of the university campus in Mundamia has warranted further growth in the area and the scale of the proposed development is considered to be appropriate. Generally, the proposed lots are similar in shape and size to those existing in the nearby local areas and are considered to be suitable in scale and density. Furthermore the proposal shall not have any adverse effects on the natural scenic quality of the surrounding area and will not be visible form the river to extensive bushland.

l) To encourage a strategic approach to coastal management.

This is a measured proposal which takes into consideration the environmental sensitivity of the site, the natural attributes of the site and all relevant legislation.

Part 2 (Clause 8): Matters for Consideration

i. The aims of this policy set out in clause 2:

As discussed above.

ii. Existing public access to and along the coastal foreshore for pedestrians or persons with a disability should be retained and, where possible, public access to and along the coastal foreshore for pedestrians or persons with a disability should be improved:

The subject site and surrounding areas are not located near a foreshore area and access to the river will not be addressed as part of the application.

iii. Opportunities to provide new public access to and along the coastal foreshore for pedestrians or persons with a disability:

See above (Part b).

iv. the suitability of development given its type, location and design and its relationship with the surrounding area:

Refer to above to policy aims (Part k).

v. Any detrimental impact that development may have on the amenity of the coastal foreshore, including any significant overshadowing of the coastal foreshore and any significant loss of views from a public place to the coastal foreshore:

Not applicable as the subject site and surrounding areas are not located near a foreshore area.

vi. The scenic qualities of the New South Wales coast, and means to protect and improve these qualities:

Not applicable as the subject site and surrounding areas are not located near a coastal area.

vii. Measures to conserve animals (within the meaning of the Threatened Species Conservation Act 1995*) and plants (within the meaning of that Act), and their habitats:*

A Flora and Fauna Assessment (Appendix 2) has been undertaken by Eco Logical Pty Ltd and is discussed in Section 7.5.

viii. Measures to conserve fish (within the meaning of Part 7A of the Fisheries Management Act 1994*) and marine vegetation (within the meaning of that Part), and their habitats:*

The proposal will not have any adverse impacts on fish or marine vegetation.

ix. Existing wildlife corridors and the impact of development on these corridors:

There are no wildlife corridors associated with the subject site.

4.3.5 State Environmental Planning Policy 44 – Koala Habitat Protection

The aims of SEPP No. 44 are:

"to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline."

It requires a judgment to be made about whether the land in a study area is potential and/or core koala habitat based on the proportion of trees present that are listed as Koala Feed Tree Species in Schedule 2 of the policy and/or the presence of koalas. These listed feed trees must constitute at least 15 % of the total number of trees in the upper or lower strata of the tree component for the vegetation to be classified as *potential koala habitat*. *Core koala habitat* is land where there is a resident population of koalas including breeding females.

The policy requires the preparation of plans of management before development consent can be granted in relation to areas of *core koala habitat*, encourages the identification of areas of *core koala habitat*, and encourages the inclusion of areas of *core koala habitat* in environment protection zones.

Response:

The policy applies to this proposal because:

- The land is within the Shoalhaven local government area;
- The land has an area of more than 1 ha; and
- A development application has been made for the proposal.

Eco Logical (2012) concluded that the study area contains Grey Gum *Eucalyptas punctata,* and is listed as a Koala feed tree species on Schedule 2 of SEPP 44. However, the species does not comprise of 15% or more of the canopy and as such, the study area does not qualify as Potential Koala Habitat. Therefore no further provisions of SEPP 44 apply, and the proposal does not require a management plan for Koala habitat.

4.3.6 State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004

Regulations under the Act have established a scheme to encourage sustainable residential development (*the BASIX scheme*) under which:

(a) an application for a development consent, complying development certificate or construction certificate in relation to certain kinds of residential development must be accompanied by a list of commitments by the applicant as to the manner in which the development will be carried out, and

(b) the carrying out of residential development pursuant to the resulting development consent, complying development certificate or construction certificate will be subject to a condition requiring such commitments to be fulfilled.

The aim of this Policy is to ensure consistency in the implementation of the BASIX scheme throughout the State.

This BASIX SEPP achieves its aim by overriding provisions of other environmental planning instruments and development control plans that would otherwise add to, subtract from or modify any obligations arising under the BASIX scheme.

Response:

The BASIX SEPP does not apply to the initial subdivision of land, however the development of the resultant allotments will need to comply with the water and energy efficiency targets established in the BASIX SEPP.

4.3.7 Coastal Design Guidelines for NSW

These guidelines consider the NSW coast in terms of a hierarchy of settlements. This provides a framework for analysing and understanding the important relationships between settlements and the local, urban and natural areas, and between neighbouring settlements and reserves. There are seven different types coastal settlements, two of which can be identified within the Mundamia urban release area as outlined below.

Inland Coastal Centres: The Nowra/Bomaderry area is identified as being an inland coastal area as it backs onto the Shoalhaven River. As outlined in the guidelines, inland coastal centres have an important role to play as the commercial and retail hub for surrounding rural lands and smaller settlements located on the coast that cannot readily access a city or a town.

Issues: Some issues facing inland coastal centres include:

- *Flooding at regular intervals affecting servicing, infrastructure and properties.*
  - Given the topography and height above sea level of the land, the subject site is in no way flood affected and the proposal causes no risk to servicing, infrastructure or properties.
- *Clearing of riparian ecologies and degradation by boating activities and new residential development.*
  - There are no riparian ecologies present on the site. The development will not encourage further boating activities within the river as no direct access to the river from the site is provided.
- *No classification, protection or recognition for the settlements heritage.*
  - A full Aboriginal Archaeological Assessment (Appendix 5) has been undertaken for this proposal and concluded that no new Aboriginal sites or area of predicted Archaeological sensitivity were identified in the study area.
- *Privatisation of the river frontage.*
  - The subject site is located away from the river frontage with no direct river access to be created.
- *No connection of the settlement to the river.*
  - The existing settlement of Nowra has a strong connection to the river, however the proposed urban release area will not create any further connection and will rely on those existing.
- *Erosion of the settlement centre's economic base as a result of large new retail developments remotely located.*
  - This proposal comprises only a very small commercial component.
- *New commercial and retail development is not compatible with the scale, design and architecture of existing buildings.*
  - Commercial component of the development will be compatible with the scale of the urban release area.
- *The beauty of the settlement is degraded with carparking, signage and large retail and commercial developments that do not respect the quality of the streets or the settlement's open spaces.*
  - The proposal does not include carparking, signage or large retail/commercial developments.

- *Large new developments erode the quality pedestrian environment throughout the settlement*.
  - The development is located away from the existing urban areas and a new pedestrian environment is proposed throughout the settlement.

As outlined above the proposed subdivision and development of this land does not conflict with the issues raised for inland coastal centres. Furthermore the development of this area reduces the pressure to develop more sensitive locations on the coastal edge which is beneficial to stimulating growth in inland centres and protecting natural areas.

New Coastal Settlements: The proposal is identified as a new coastal settlement as it involves a subdivision of over 25 residential lots. As outlined in the guidelines these new settlements offer the opportunity for best practice planning on a neighbourhood and place-based approach that minimises impacts on vegetation clearance, water quality and ecological integrity.

Issues: Some issues facing new coastal settlements include:

- *Removal of the unique topographic and natural features of the location, the site and the local area*
  - The proposal does not include any major alterations to the topography of the site. The existing vegetation on site is to be cleared as part of the development as outlined in this report. A Flora & Fauna Assessment (Appendix 2) has been prepared to identify what natural features of the site will be impacted and the mitigation measures to be imposed.
- *New development that is not planned to respond to the local context in terms of open space, access and existing centres or main streets*
  - The proposed subdivision and urban release area is located separately to the existing established areas surrounding. Open space area and access to the release area is to be created as part of the proposal.
- *Privatisation of the coastal and natural edges*
  - The subject site is located away from the river frontage with no direct access available to be created.
- *A lack of public open space for recreation, water management, ecological protection and social functions*
  - The proposed subdivision has included three (3) public open space allotments being; Lot 77 positioned along the spine road; Lot 90 positioned along Jonsson Road; and Lot 25 which is 8644m^2 and positioned at the centre of the subdivision to cater to all residents of the area. A Hydrological Assessment (Appendix 6) and Stormwater Management Assessment (Appendix 8) has been carried out by Martens Consulting Engineers which have concluded the proper management of water can be achieved and have provided appropriate measures that are to be taken. Eco Logical Australia have carried out a Flora & Fauna Assessment which indicates the existing species on site and their significance. The Assessment also outlines the mitigation measures to be taken to protect surrounding threatened species. The subdivision layout includes an allotment (Lot 24) which has been reserved to form a village centre/commercial activity. This area will provide for social interaction and encourage pedestrian movement within the release area. Furthermore the release area is located within close proximity to the university campus and the Nowra CBD to cater for the required social functions.

- *Subdivisions designed merely for efficient traffic movement*
  - The proposed subdivision has been designed to incorporate appropriate traffic movement as outlined in the Traffic Impact Study (Appendix 4). This study indicates how appropriate vehicular movements will be achieved to and from the area and within the subdivision itself. However the road layout also has been designed to encourage slow traffic movements within the residential area and furthermore where possible encourage pedestrian activity to minimise vehicular use.
- *Development too close to fragile coastal environments, particularly dunes, beaches, lakes, riverine and stream corridors*
  - The subject site is not within close proximity to any fragile coastal environments such as dunes or beaches. The site is approximately 400m south of the Shoalhaven River with no direct access from the site to the river. The proximity of the subdivision is considered to have very minimal impact on the river.
- *Development located on flood prone land involving land fill*
  - The subject site is not flood prone.
- *Development that disturbs acid sulphate soils indiscriminate expansion on the edges of existing coastal hamlets and villages*
  - A Geotechnical Assessment (Appendix 9) was carried out for the proposal which identified the subject site as containing traces acid sulfate soils. Section 7.7 of this report outlines the extent of acid sulfate soils within the site and how these are to be mitigated for the development.
- *Development creating strip or ribbon development along the coast including major arterial roads*
  - The proposal will not result in a strip or ribbon type development.
- *Locating new settlements within the greenbelts of existing settlements*
  - The new urban release area is situated separate from existing urban settlements and does not affect the greenbelt of any surrounding settlements.
- *Residential development without neighbourhood centres or a main street*
  - The release area includes a village/neighbourhood centre to incorporate community and commercial activities to cater for new residents of the area.
- *Development on land likely to be affected by coastal hazards, now or in the future*
  - Significant coastal hazards are non-existent within the subject area.
- *Privatised enclaves and gated communities that restrict public access and connection to the local area*
  - The urban release area is not to be privatised or gated and public access is encouraged.
- *A street pattern that forces residents to drive rather than walk or cycle*
  - The road layout and position of public open space and the village centre has been designed to encourage pedestrian and cycle movements and limit the need to vehicular use around the release area.
  - The street layout includes connectivity and permeability of the future urban form.
- *Building design and materials inappropriate for the local climate*

  - Building design and materials to be used are to be addressed within the Mundamia Development Control Plan.

- *High site coverage and no private open space*
  - All low density allotments have been given appropriate lot sizes, being at least 500m^2 to allow for adequate private open space to be provided. The same has been achieved for the medium density lots and the application of private open space will be addressed within the Mundamia Development Control Plan.
- *No diversity in housing choice*
  - The proposed allotments within the subdivision has provided for a range of housing choices including low density single dwelling lots, dual occupancy lots, and medium density lots.
- *Degraded ground and surface water quality resulting from urban pollutants and sedimentation*
  - A Hydrological Assessment (Appendix 6) has been carried out to determine the possible impacts on the water quality and the appropriate mitigation measure to be taken. The findings from the assessment concluded that development of the site is able to proceed with a neutral impact provided the recommendations are adhered to.
- *Poorly maintained, unsafe and under utilised public lands.*
  - The public open spaces and water management devices within the release area are to be maintained by Shoalhaven City Council in accordance with the Statement of Commitments as outlined in Section 8 of this report.

As outlined above the proposed subdivision does not conflict with the issues raised for new coastal settlements. Furthermore the proposal provides for present and future opportunities in accordance with the coastal design guidelines and achieves the desired future character in that it avoids ribbon development and considers ecological qualities, settlement types, separation between settlements, transportation, employment opportunities and population capacity.

Design Guidelines

Defining the footprint and boundary: There are four (4) scenarios in which coastal settlements can accommodate development: 'No or Limited Development', 'Maintaining a Compact Settlement Footprint', Expanding the Boundary of a Settlement' and 'Creating a New Settlement'. Given the nature and location of the subdivision the scenario that is being proposed falls under 'Creating a New Settlement'.

Creating a New Settlement

1. *New settlements contain:*
   a. *substantial surrounding greenbelts*
      - The new urban release area is surrounded by E3 Environmental Management Zone, as per the Draft Shoalhaven LEP 2009. This land is to be retained and remain undeveloped.
   b. *substantial and continuous foreshore reserves, where – relevant*
      - There is no established foreshore area within or associated with the subject site.
   c. *maximum setback distances required to protect natural areas*

- Appropriate offsets have been provided around the subdivision and to ensure the natural areas and vegetation retained are not significantly impacted upon.

d. provisions so as not to impact on the visual character or vistas of existing settlements or agricultural land.

- A Visual Impact Assessment (Attachment 11) has been carried out for the proposal and has been addressed in Section 7.9 of this report. The findings of the assessment concluded that given the location and topography of the site the development will not significantly impact the visual character or vistas of existing settlements or agricultural land.

2. *Design criteria for new settlements involve:*

a. responding to the environmental constraints of the location

- A Flora & Fauna Assessment (Appendix 2) has been carried out outlining the existing environmental constraints of the location. The assessment has provided detail on the vegetation to be removed and appropriate mitigation measures to be enforced. This is further discussed in Section 7.5 of this report.

b. maintaining the water quality of lakes, rivers and coastal waters at pre-development levels

- Given the proximity of the site to the river and lack of direct access, the subdivision and development will result in minimal impact on the water quality of the river.

c. retaining existing trees and vegetation

- The Flora & Fauna Assessment (Appendix 2) has indicated the vegetation to be removed and provided detail of the species and their significance. Although all of the subject site is to be cleared, surrounding vegetation is to be retained and appropriate mitigation measures have been recommended to ensure these parts are not impacted upon.

d. providing facilities and services appropriate to scale and type of settlement

- The proposed subdivision has ensured the provision of the necessary facilities as well as providing adequate public open space and village centre to cater for residents of the areas.

e. including a town/neighbourhood centre or a main street

- A village/ commercial centre has been provided along the spine road which is to form the main road and centre of the new urban release area.

f. requiring a permeable, hierarchical street subdivision pattern that relates to the original topography.

- The subject site is relatively flat and the topography will define the subdivision street pattern or design.

3. *Design that relates to quality building types and allows the possibility for more compact building types in the future.*

- The allotment layout and sizes cater to quality buildings types with adequate frontages and densities that will allow for quality building design with appropriate setbacks and private open spaces. The subdivision also proposes lots that are suited to dual occupancy and medium density development.

4. *Making provision for more dense development, such as semidetached houses and small apartment buildings with higher density housing located within close to the centre.*

   – Lot 22, 32, 53, 97 and 102 have been designed for dual occupancy or semidetached houses. Lots 5, 18, 23, 26, 39 and 40 have been designed to cater for medium density development that may include townhouse or apartment buildings.

5. *Ensuring the efficient use of land by designing blocks, lots and buildings together.*

   – Given the nature of the urban release area, the majority of the lots have been designed together and in accordance with the Mundamia Masterplan and surrounding subdivisions. The physical development of these individual lots will be addressed in accordance with the Mundamia Development Control Plan.

Connecting open spaces

1. *Locate and connect new and existing open spaces which protect and maintain:*

   a. *nature reserves, conservation areas, park lands and environmental protection areas*

      – New open spaces have been created within the proposal however these will not be directly connected to any existing open spaces. This urban release area does not adjoin or is not within close proximity (in terms of pedestrian movement) to existing settlements within the area. The surrounding environmental protection areas will be maintained.

   b. *the natural and rural setting of the settlement including the scenic values of the visual catchment*

      – The proposal aims to retain a natural rural setting to the area by retaining surrounding vegetation and incorporating appropriate landscaping. The scenic values of the area will not be significantly affected as indicated in the Visual Impact Assessment (Attachment 11) and Section 7.9 of this report.

   c. *remnant native vegetation.*

      – As discussed in this report all existing vegetation on site is to be removed as part of this subdivision. However all surrounding native vegetation is to be retained and managed appropriately.

2. *Establish continuous ecological corridors to incorporate existing remnant vegetation by connecting reserves and conservation areas from the hinterland or surrounding mountains to the coastal edge.*

   – The area currently has an established ecological corridor as it is primarily rural or environmental management land. The subject site comprises of a small section of this corridor and does not affect the coastal edge.

3. *Provide setbacks to protect property from the effects of coastal erosion, flooding and bushfire.*

   – The subject site is located approximately 400m from the Shoalhaven River with no potential impact of coastal erosion. The site is not flood prone and a Bushfire Assessment (Appendix 3) has been carried out to outline the bushfire threat and mitigation measures.

4. *Locate open-spaces to build on the special attributes of an area for long-term public amenity and identity of the place. An open-space network may include hill tops, river frontage, mature trees, places with panoramic views, rocky outcrops and remnant vegetation.*

- There is little opportunity within the area to locate the open space areas with special attributes. Alternatively the open space has been located so that it can be easily accessible for all surrounding residents and within the village centre.

5. *Where feasible preserve settings for places of cultural heritage within the open-space network.*
    - As concluded within the Aboriginal Archaeological Assessment (Appendix 5) there are no Aboriginal sites or areas of predicted Archaeological sensitivity identified in the study area.
6. *Provide areas within the open-space network sufficient to detain and cleanse stormwater runoff and avoid impacting sensitive ecologies.*
    - As per the Stormwater Management Assessment (Appendix 8) there are three (3) retention basins within the subdivision to manage stormwater runoff. The larger retention basin is within the main open space area (Lot 25) and includes a wetland, another is within open space (Lot 77) and Lot 90 is used as an overland swale to service the retention basin within Jonsson Road.
7. *Establish edge open-spaces with streets and pedestrian pathways. These are best located within the development footprint of the settlement, rather than in an open-space zone.*
    - Lots 77 and 90 are proposed open space lots located along the spine road and Jonsson Road. The main open space area (Lot 25) adjoins the village centre and encourages pedestrian movements.
8. *Provide pedestrian and cycle access that:*
    a. *does not compromise the ecological values of high conservation areas*
    b. *connects important places throughout the settlement*
    c. *connects residential areas to commercial and retail locations without compromising the visual, aesthetic or ecological values of the foreshore.*
        - Pedestrian and cycle access is provided throughout the subdivision connecting the village centre and open space to all residential allotments. This does not compromise the visual, aesthetic or ecological values or the area.
9. *Provide a variety of large and smaller open spaces to serve a range of different active and passive recreational roles, for example:*
    a. *playing fields*
    b. *playgrounds and small pocket parks*
    c. *walking and cycling connections*
    d. *places and activities for people with physical disabilities.*
        - Open space Lots 77 and 90 are 519m^2 and 872m^2 respectively and are to be used for walking and cycling connections. Open space Lot 25 is 8644m2 and will be able to cater to playgrounds and playing fields.
10. *Co-locate recreational facilities with shops, schools and other community facilities to reduce parking and minimise walking distances.*
    - The recreational area (open space) and village/community centre of the subdivision is located primarily in the middle of the subdivision in accordance with the overall urban release area to increase pedestrian movement and minimise walking distances.

11. *Landscape design of open spaces should reflect the different qualities of the location and their functions.*

    – The Landscape design (Attachment 12) shows how the open spaces reflect the different qualities of the location and their function.

Protecting the natural edges

– The subject site is located approximately 400m south of the Shoalhaven River with no direct access. For this reason the site and proposed development does not pose any threat to any coastal ecosystems or the natural edges and achieves the objectives and design guidelines for 'Protecting the natural edges'.

Reinforcing the street pattern

– The proposed subdivision and road network includes a main access road, main street (spine road), edge streets, residential streets, laneways and pedestrian pathways.

Reinforcing the street pattern can be achieved by:

1. *Building on the original and established street and block patterns in terms of the pattern of circulation, access to lots and uses.*

   – There are no original or established street and block patterns.

2. *Ensure the settlement is easily navigable and logical in terms of access and location of uses.*

   – The street layout is considered to be easily navigable and logical with established access points, a main road and appropriately positioned streets and laneways.

3. *Optimise the number of connections within the street hierarchy. The traditional grid provides high accessibility and permeability for pedestrians and vehicles.*

   – The street layout design optimises connections within the release area and provides accessibility and permeability for pedestrians and vehicles.

4. *Recognise or design streets in response to the topography and other natural features by ensuring a predominance of streets that relate to the original landform.*

   – The subject site is relatively flat and the topography of the land in this case bares no weight on the overall street network or design.

5. *Protect streets that provide access and views to the coast, foreshores and headlands, other significant natural features and places of public importance.*

   – The proposed streets do not provide access or views to the coast, foreshores or other significant natural features and places of public importance.

6. *Allow for changes on private land whilst valuing the qualities of individual streets including:*

   a. *their order within the hierarchy*

   b. *access and street address*

   c. *carriageway, footpath and reserve alignments, building setbacks*

   d. *street trees which will offer filtered views of the coast*

e. vistas and view corridors.

- Given its location development of the subject land will adversely affect the surrounding areas and is not within close enough proximity to impact upon any exiting residential area.

7. *Minimise road crossings over waterways and water bodies.*
   - There are no road crossings over waterways or water bodies.
8. *Encourage grass swales and pervious surfaces to increase stormwater infiltration.*
   - Overland grass swales have been provided (within Lot 90) to service retention basins as well as bio swales throughout the subdivision along the road reserves.

The street hierarchy can be strengthened by:

9. *Protecting the rural and natural character of the main access roads by restricting development fronting onto them.*
   - The proposal aims to retain the rural and natural character of the area especially throughout the access to the subdivision. Access is restricted off the spine road at the beginning of the subdivision where the medium density Lot 5 is positioned. Development on this lot will be accessed off 'Road 6'.
10. *Reinforcing main streets as the commercial and social heart of the settlement.*
    - The main street of the subdivision and release area has been reinforced as the commercial and social heart of the settlement by positioning the village centre and main public open space area along it.
11. *Developing public edge roads around the settlement to provide separation between urban areas and sensitive ecologies and open-space areas. This provides asset protection zones for bushfire management and access to open spaces, foreshores and headlands.*
    - The surrounding edge roads being George Evans and Jonsson Road contain 25m asset protection zones for bushfire management and access to open space.
12. *Limiting fast moving through traffic in residential streets.*
    - The road network has been designed to discourage fast traffic movements throughout the subdivision. As the new release area does not connect any other residential or commercial parts of town, the development will primarily be used by residents only and not passers-by.
13. *Protecting laneways in residential and commercial areas from being built into or over.*
    - The subdivision includes the construction of one (1) laneway (Lane 1) 7m wide. This laneway forms the access for Lots 1-3 and there is no future threat to this being built into or over.
14. *Establishing a system of pedestrian pathways throughout the settlement and between settlements.*
    - There is a pedestrian pathway system proposed for the subdivision which is to form a connection to the rest of the urban release area. However given this release area is separate from other residential areas there will be no pedestrian connection made between established settlements.
15. *Reinforcing streets with appropriate street vegetation planting.*
    - Appropriate landscaping and street vegetation planting is to be introduced for the subdivision as per the landscape plan (Attachment 12).

Appropriate buildings for coastal context

- The built form of the residential and commercial buildings to be developed throughout the proposed subdivision is to be regulated in the new Shoalhaven Development Control Plan (DCP) for Mundamia. This DCP has not yet been completed or put on exhibition. The lot sizes proposed will ensure that adequate space has been provided to enable appropriate setbacks and private open space can be achieved. Furthermore all development to be built within the proposed subdivision will not be located within prominent coastal sites, on dunes or the foreshore reserve, the coastal edge or areas with heritage/significant elements.

4.3.8 NSW Coastal Policy 1997

The 1997 NSW Coastal Policy sets the context in providing for population growth and economic development at the same time protecting the natural, cultural, spiritual and heritage values of the coastal environment. To achieve this, the Policy has a strong integrating philosophy based on the principles of ecologically sustainable development. The policy is based on the four principles of ESD contained in the Intergovernmental Agreement on the Environment (IGAE) signed in 1992. These principles are:

1. *Conservation of biological diversity and ecological integrity. This refers to the need to conserve the variety of all life forms, especially the variety of species, and to ensure that the productivity, stability and resilience of ecosystems is maintained.*

    - Studies undertaken found that the subject site and surrounding areas do not contain any coastal ecosystems or species however ESD principles have been considered throughout the planning and design of this proposal. As a result the proposed subdivision was assessed against social, economic and environmental factors to ensure the proposal satisfied the ESD principles. The proposal was developed to minimise negative impacts and maximise benefits to the local community and give due consideration to the environment. Eco Logical Australia have outlined particular mitigation measures in their Flora & Fauna Assessment (Appendix 2) in accordance with the principles of ESD. Eco Logical concluded that the development of the proposed subdivision at Mundamia is not likely to have a significant effect on threatened species, endangered populations, ecological communities, or their habitats, provided that effective measures are undertaken to control, monitor and manage indirect impacts of the proposal on nearby habitats of conservation value. Section 4.2.1 of this report outlines how the Threatened Species Conservation Act 1996 (TSC Act) has been addressed and what requirements will be enforced for the proposal to ensure ESD.

2. *Inter-generational equity. This requires that the health diversity and productivity of the environment is maintained or enhanced for the benefit of future generations. Social equity considerations, in terms of equal access opportunities to resources, is inherent in the concept of inter-generational equity.*

    - The proposal acknowledges the potential on-going strain that the development may have on the areas natural environment. As outlined above the area does not contain any coastal ecosystems or resources. The development as well as the on-going use of the site will require mitigation for waste disposal. A waste management plan is to be formulated during the Construction Certificate stage of the project. This will ensure all waste generated as a result of the development will be managed in an appropriate manner.

3. *Improved valuation, pricing and incentive mechanisms. This requires environmental factors, such as the value of ecosystems, polluter pays principles etc., to be incorporated into the valuation of assets and services and considered in decision making processes.*

    - As outlined in the Contamination Assessment (Appendix 7) all contaminated land will be disposed of at an approved land waste facility in accordance with an approved Remedial Action Plan. The subdivision design acknowledges the surrounding threatened species and the proposed stormwater system has been designed in a manner that addresses water sensitive urban design principles. The Stormwater Management Assessment (Appendix 8) has outlined how the stormwater system is to maintain existing flows and nutrient loads where possible to minimise possible adverse impacts on sensitive flora located downslope of the development site.

4. *The precautionary principle. Requires a risk averse approach to decision making. Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty is not to be used as a reason for postponing measures to prevent environmental degradation.*

    - Although the full extent of risk to a site is always somewhat uncertain the significance of the potential impacts to the site have been recorded and assessed against the appropriate policies. Even though there have been no threated or coastal species recorded on site the studies carried out such as the Flora & Fauna Assessment, Contamination Assessment and Stormwater Management Assessment have stressed the need for precautionary measures to prevent any environmental degradation. Again as the subject site and surrounding area is not located within a coastal area prone to shoreline recession or sea level rise mitigation measure have only addressed those species within the locality.

4.4 Regional Environmental Planning Policies

4.4.1 Illawarra Regional Environmental Plan No. 1

The IREP No. 1 sets out the regional planning context for the land. This plan aims to maximise the opportunities for the people of the region and the state to meet their individual and community, economic and social needs. Particular reference is paid to the way in which these needs are related to the allocation, availability, accessibility and management of the region's land resources having regard to the objectives specified in the REP. Part vii, Division 1 - Provisions Relating To Living Areas applies to the subject site.

Response:

The proposed development as described satisfies the above objectives, as it will not prejudice the future use of the land for urban purposes and delivers benefits to the community by way of dedicating ecologically sensitive land for public benefit.

4.4.2 South Coast Regional Strategy

The South Coast Regional Strategy (2007) has been prepared by the Department of Planning & Infrastructure and applies to the local government areas of Shoalhaven, Eurobodalla and Bega Valley.

The South Coast is one of the high growth regions in NSW. The primary purpose of the Regional Strategy is to ensure that the significant natural and scenic assets that define the region's character and underpin its

economy are not compromised by growth. The Strategy aims to ensure that land is available in appropriate locations to sustainably accommodate the projected population growth and associated housing, employment and environmental needs over the next 25 years.

Whilst the Regional Strategy does not identify specific regional infrastructure needs, it will however, inform the work undertaken by the Government to determine infrastructure investment priorities for the South Coast. Infrastructure planning will take into account the broad planning framework identified in the Strategy, to ensure that future population growth is supported by essential human services and associated infrastructure.

The South Coast Regional Strategy provides the framework and context to guide the preparation of all new LEPs within the region. The new LEP will guide future development and must be consistent with the outcomes and actions in the South Coast Regional Strategy.

A review of the South Coast Regional Strategy with regard to this proposal provides the following main findings:

- An additional 26,300 dwellings will be required in the Shoalhaven over the next 25 years, of which 23,900 can potentially be accommodated by existing vacant urban land and existing investigation areas.
- A majority of this land is located around the major centre of Nowra– Bomaderry.
- One of the main attractions of the South Coast as a place to visit and live is the distinctive rural and coastal character of the region's towns and villages.
- The South Coast is characterised by many separate settlements ranging from small villages with less than 200 people (e.g. Hyams Beach and Tilba Tilba) up to the major regional centres of Nowra–Bomaderry, Batemans Bay and Bega. Whilst the dispersed nature of settlements is part of the charm of the South Coast, the Regional Strategy maintains that continued expansion of smaller villages and creation of new ones has the potential to place a strain on services and Infrastructure.
- Future urban development will be prioritised to support housing and new residential subdivisions located adjacent to existing well serviced centres and towns. The major regional centres of Nowra–Bomaderry, Batemans Bay, Bega and the major towns of Ulladulla, Moruya, Narooma, Merimbula and Vincentia (serving the Jervis Bay and St Georges Basin area) are nominated to accommodate the majority of future growth. The Regional Strategy also allows some small expansions around existing villages and rural towns that will support the role of the town in serving surrounding communities.

Response:

The proposal will create an additional 105 residential properties in a unique rural setting. While it is recognised that the continued expansion of Mundamia has the potential to place strain on the existing services and infrastructure the nature of the proposed subdivision is that of small-scale residential release development. All the relevant stakeholders have been contacted and have advised that there is adequate capacity within the local services/infrastructure to handle the increase in population as the result of the proposal.

The proposed subdivision is in line with the aim and objectives of the South Coast Regional Strategy. The proposal provides a range of lot sizes allowing for a variety of dwelling types. The subdivision layout has been designed to protect the existing surrounding environment, and to reinforce the street pattern within the local area. The proposed road network caters for all road users including, pedestrians, cyclists, cars and buses. Overall the objective of the subdivision is to provide a safe, attractive, energy efficient and liveable neighbourhood that fosters a sense of community to promote better social, economic and environmental sustainability.

Sustainability Criteria (Appendix 1)

Threshold Sustainability Criteria for any proposed development site outside designated areas in the South Coast Regional Strategy	Measureable explanation of criteria
1. Infrastructure Provision Mechanisms in place to ensure utilities, transport, open space and communication are provided in a timely and efficient way	• Development is consistent with the South Coast Regional Strategy, any subregional strategy, the State Infrastructure Strategy and relevant section 117 direction/s. • The provision of infrastructure (utilities, transport open space and communications) is costed and economically feasible based on government methodology for determining infrastructure development contributions. • Preparedness to enter into development agreement.
2. Access Accessible transport options for efficient and sustainable travel between homes. Jobs, services and recreation to be existing or provided	• Accessibility of the area by public transport and/or appropriate road access in terms of: - Location/land use – to existing networks and related activity centres. - Network – the area's potential to be serviced by economically efficient transport services. - Catchment – the area's ability to contain, or form part of, the larger urban area which contains adequate transport services. Capacity for land use/transport pattern to make a positive contribution to achievement of travel and vehicle use goals. • No net negative impact on performance of existing subregional roads, bus, rail, ferry and freight network.
3. Housing Diversity Provide a range of housing choices to ensure a broad population can be housed	• Contributions to the geographic market spread of housing supply, including any government targets established for aged, disabled or affordable housing.
4. Employment Lands Provide regional/local employment opportunities to support the South Coast's expanding role in the wider regional and NSW economies	• Maintain or improve the existing level of subregional employment self-containment. • Meets subregional employment projections. - Employment-related land is provided in appropriately zoned areas.
5. Avoidance of Risk Land use conflicts, and risk to human health and life, avoided	• No residential development within 1:100 floodplain. • Avoidance of physically constrained land e.g. - Avoidance of land use conflicts with adjacent existing or future land use as planned under relevant subregional or regional strategy. • Avoidance of land use conflicts with adjacent existing or future land use as planned under relevant subregional or regional strategy. • Where relevant, available safe evacuation route (flood and bushfire)
6. Natural Resources	• Demand for water within infrastructure capacity to supply water and does not place

Natural resource limits not exceeded/environmental footprint minimised	unacceptable pressure on environmental flows • Demonstrates most efficient/suitable use of land: - Avoids identified significant agricultural land, - Avoids productive resource lands – extractive industries, fishing and forestry. • Demand for energy does not place unacceptable pressure on infrastructure capacity to supply energy – requires demonstration of efficient and sustainable supply solution.
7. Environmental Protection Protect and enhance biodiversity, air quality, heritage and waterway health	• Consistent with government approved Regional Conservation Plan. • Maintains or improves areas of regionally significant terrestrial and aquatic biodiversity (as mapped and agreed by DEC). This includes regionally significant vegetation communities; critical habitat threatened species; populations; ecological communities and their habitats. • Maintain or improve existing environmental condition of air quality. • Maintain or improve existing environmental condition for water quality: - Consistent with community water quality objectives for recreational water use and river health (DEC and CMA). - Consistent with catchment and stormwater management planning (CMA and council). • Protects areas of Aboriginal cultural heritage value (as agreed by DEC).
8. Quality and Equity in Services Quality health, education, legal, recreation, cultural and community development and other government services are accessible	• Available and accessible services: - Available and accessible services - Do adequate services exist? - Are they at capacity or is some capacity available? - Has government planned and budgeted for further service provision? - Development funding for required service upgrade/access is available.

Response:

1. Infrastructure Provision

- The proposal is consistent with the South Coast Regional Strategy in that it contributes to the required dwelling numbers outlined in the strategy for the Shoalhaven area including the medium density housing. The subdivision is also consistent with the particular 'Sustainability Criteria' as discussed below.
- The State Infrastructure Strategy identifies four infrastructure objectives for Regional NSW:
  - Improve access to employment and to connect people and communities;
  - Improve local transport networks;
  - Efficient access to markets, particularly mining and agriculture products to domestic and international markets;
  - Improve water quality and security.

Previous studies of the Mundamia release area have identified how this new residential hub will be connected with surrounding communities and employment centres such as Nowra and Bomaderry. The area is in close proximity and has access to an array of markets both locally and interstate. Traffic studies carried out indicate how the release area will be services and networked into the existing transport infrastructure.

- The following Section 117 Directions, issued by the Minister for Planning & Infrastructure, are relevant for this proposal:

  - 2.1 Environmental Protection Zones: *The objective of this direction is to protect and conserve environmentally sensitive areas.* Section 7.5 of this report discusses the potential impacts that the development may have on surrounding environmentally sensitive areas. Findings from the Flora & Fauna Assessment (Appendix 2) are discussed which identify the species found in the area and the mitigation measures that are to be enforced to protect these species. Section 9.3 outlines the ecological sustainable development concepts that have been adopted for this proposal to ensure the development is carried out in a way that protects and conserves are environmentally sensitive areas.

  - 2.2 Coastal Protection: *The objective of this direction is to implement the principles in the NSW Coastal Policy.* The principles of the NSW Coastal Policy have been addressed in Section 4.3.7 of this report.

  - 2.3 Heritage Protection: *The objective of this direction is to conserve items, areas, objects and places of environmental heritage significance and indigenous heritage significance.* Section 7.4 of this report outlines the findings of the Aboriginal Archaeological Assessment (Appendix 5) and what mitigations measures are to be implemented for the protection of any indigenous conservation items.

  - 3.1 Residential Zones: *The objectives of this direction are:*

    (a) to encourage a variety and choice of housing types to provide for existing and future housing needs,
    (b) to make efficient use of existing infrastructure and services and ensure that new housing has appropriate access to infrastructure and services, and
    (c) to minimise the impact of residential development on the environment and resource lands.

    One of this main goals for this proposal is to provide a variety of housing types in the area. As discussed throughout this report a large portion of the proposed subdivision is to be dedicated for medium density development which has a dwelling yield of approximately 69 dwellings. This will fill some of the void of this type of housing within the area and provide for more affordable housing.

    Although there is currently limited infrastructure within and around the subject site, Section 3.6 and 3.7 discusses how new infrastructure, facilities and services are to be implemented into the area and how they are to service the new development.

    Section 7.5 of this report outlines the finding of the Flora & Fauna Assessment (Appendix 2) and what mitigation measures are to be implemented to minimise the impacts on the environment and resource lands. This is further discussed in Section 9.3 in regards to ecological sustainable development.

  - 4.1 Acid Sulfate Soils: *The objective of this direction is to avoid significant adverse environmental impacts from the use of the land that has a probability of containing acid sulfate soils.* A Geotechnical Assessment (Appendix 9) was carried out for the proposal which identified the subject site as containing traces acid sulfate soils. Section 7.7 of this

report outlines the extent of acid sulfate soils within the site and how these are to be mitigated for the development.

- 4.4 Planning for Bushfire Protection: *The objectives of this direction are:*

  (a) to protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and
  (b) to encourage sound management of bush fire prone areas.

  A Bushfire Protection Assessment (Appendix 3) was carried out for the proposal as RFS mapping indicates the site as being bushfire prone. The assessment outlines extent of potential bushfire area and what measures and APZ are to be enforced to ensure the development will be properly protected from bushfire. These potential for bushfire and mitigation measures are further discussed in Section 7.6 of this report.

- It is understood that the proponents of the land will be providing the funding for the development.

2. Access

- As indicated in the Traffic Impact Assessment (Appendix 4) the proposed subdivision and any increase in traffic generated will be appropriately catered to by both existing road and transport networks. Being located within close proximity to major community and employment centres, such as Nowra and Bomaderry, the new release area will be easily accessed and serviced.
- The new Mundamia release area will also form as a part of the existing urban area of Nowra and easily connect to existing transport services.

3. Housing Diversity

- Strategic directions have been provided in the Nowra Bomaderry Structure Plan for new living areas and make these areas more viable in terms of urban and community services. This is consistent with State Government Policy which advocates a range of dwelling types and living opportunities including a strong component of urban consolidation where infrastructure supports densities.
- Residential development for the Mundamia release area aims to consist of a mix of medium density and detached dwellings. As per the Mundamia Masterplan, the subdivision aims to cater for both high quality and affordable medium density housing in the vicinity.

4. Employment Lands

- The proposed development and Mundamia release area will not only serve the areas existing population, it will also cater to those currently living outside of the area with the intention to relocate. Due to its extensive size the construction process itself for the subdivision and development will provide employment opportunities to those in the area.
- A significant increase in population, as is forecasted for the release area, will boost the local economy and provide further employment opportunities in the area. Furthermore, the subject development proposes to incorporate a commercial component to cater to those in the Mundamia area including the University.

5. Avoidance of Risk

- The subject site is located within an existing rural area, primarily consisting of extensive bush land. There are no adjacent or surrounding land uses that the proposal will have a direct conflict with.
- The site not located within a 1:100 floodplain.
- The site is bushfire prone and appropriate evacuation and safety measures have been outlined in the Bushfire Risk Assessment in Appendix 3.

6. Natural Resources

- The increased in demand for water and energy will not place unacceptable pressure on environmental flows or the existing infrastructure. As outlined in the report, additional infrastructure is to be developed to cater for the new development. Furthermore Integral Energy and Shoalhaven Water have confirmed that the proposed development will be able to be serviced by existing networks within the area. The proposal will not cause any detrimental effects to any significant agricultural land, extractive industries, fishing or forestry.

7. Environmental Protection

- As a result of database searches, literature review and field studies, several species were considered likely to occur in the subject site and/or could be affected by the proposal. The potential impact of the proposal on these species has been assessed under relevant legislation. Eco Logical Pty Ltd conducted an assessment of significance (Appendix 2) under Section 5A of the EPA Act on those species with potential to occur on the site or otherwise be affected by the proposal. The outcome of the assessment was that it is unlikely that the development would significantly impact on those threatened fauna species assessed. Provided that effective measures to further investigate, mitigate and manage indirect impacts to nearby *Pterostylis ventricosa* and *Triplarina nowraensis* habitat are implemented as part of the proposal, it is unlikely that the development would significantly impact on threatened flora species.
- The proposed development will generally have a minimal impact on the air quality of the local environment. The following points are made with regards to mitigation of air pollution:
  - The majority of the fugitive air emissions will occur during the construction phase. An erosion control and dust suppression plan will be prepared and provided as part of the documentation for a construction certificate for the proposed development.
  - All future dwellings constructed within the proposed subdivision, will be required to satisfy the BASIX SEPP requirements.
  - The proposed development will result in an increase in traffic movement of 550 vehicle movements per day. This is considered to be a relatively small increase in the overall traffic movements of the local area.
- The closest water bodies to the site are the Shoalhaven River and Flat Rock Creek which are located 580m north and 1.6km west of the site respectively. Furthermore as the site is located on a sandstone escarpment, the relief from the development site to receiving waters is steep. The water from the site would therefore need to be discharged over/through the adjoining properties before either being discharge into the Shoalhaven River to the north or Flat Rock Creek to the east. Previous site use as a quarry / gravel pit has reshaped the natural site surface. The site falls to its centre which consists of a flat (slopes <5%) exposed sandstone surface. Drainage is facilitated by a manmade channel that runs north and exits the site under Jonsson Rd. Martens Surface Water Hydrology Assessment (Appendix 6) outlines measures to be taken that are sized

through iterative hydrological, hydraulic and water quality modelling. Design takes account of requirements for groundwater recharge determined in the hydrogeological assessment. Further mitigation measures and recommendations are provided in Martens Consulting Engineers Pty Ltd Stormwater Management Plan (Appendix 8)

- Navin Officer Heritage Consultants Pty Ltd were engaged to conduct an Aboriginal Heritage Assessment of the subject site in 2005 (Appendix 5). The assessment concluded that no aboriginal sites were recorded during the study and there are no areas of predicted archaeological sensitivity within the study area. The assessment recommended that:
  - No further archaeological investigations are necessary for the Mundamia residential subdivision project
  - The protocols for the unanticipated discovery of archaeological material and suspected human remains be adopted and complied with during construction activities involving ground surface disturbance and excavation.

8. Quality and Equity in Services

- Shoalhaven City Council's community profile identifies Mundamia being situated within 'Planning Area 1' which also includes, but is not limited to, areas such as Berry, Bomaderry, Cambewarra, North Nowra, Nowra and South Nowra. The area includes the LGA's largest commercial, retail and residential area and predominate industries include manufacturing, retail, tourism, government, defence and agriculture. Major features and services include Nowra CBD, Stockland Nowra (shopping centre), Shoalhaven City Council Administrative Centre, TAFE NSW Illawarra Institute (Nowra Campus), University of Wollongong (Shoalhaven Campus), Seven Mile Beach National Park, the Shoalhaven River, HMAS Albatross, Fleet Air Arm Museum, Flinders Industrial Estate, Albatross Aviation Technology Park, Nowra Speedway, Nowra Golf and Recreation Club, Shoalhaven Heads Golf Club, Worrigee Links Golf Course, Bamarang Nature Reserve, Brundee Swamp Nature Reserve, Cambewarra Range Nature Reserve, Comerong Island Nature Reserve, Tapitallee Nature Reserve, Triplarina Nature Reserve, Wogamia Nature Reserve, Worrigee Nature Reserve, Shoalhaven District Memorial Hospital, Nowra Private Hospital, David Berry Hospital, Nowra Wildlife Park, Shoalhaven Camellia Gardens, Meerogal (historic home), Nowra Airport, various state forests, several wineries and numerous schools.
- The array of services available in the Shoalhaven LGA and within close proximity to Mundamia are quite extensive and it is forecasted that these will be able to cater the potential increase in population as a result of the proposed development.

4.5 Local Environmental Planning Policies

4.5.1 Shoalhaven Local Environmental Plan 1985

The subject land is currently zoned 1(d) General Rural under the Shoalhaven Local Environmental Plan (LEP) 1985. A subdivision of this nature does not comply with the requirements under Clause 11 of LEP 1985. As such this proposal is to be assessed under the Shoalhaven Draft LEP 2009 which includes the rezoning of the subject land to cater to the subdivision as outlined below.

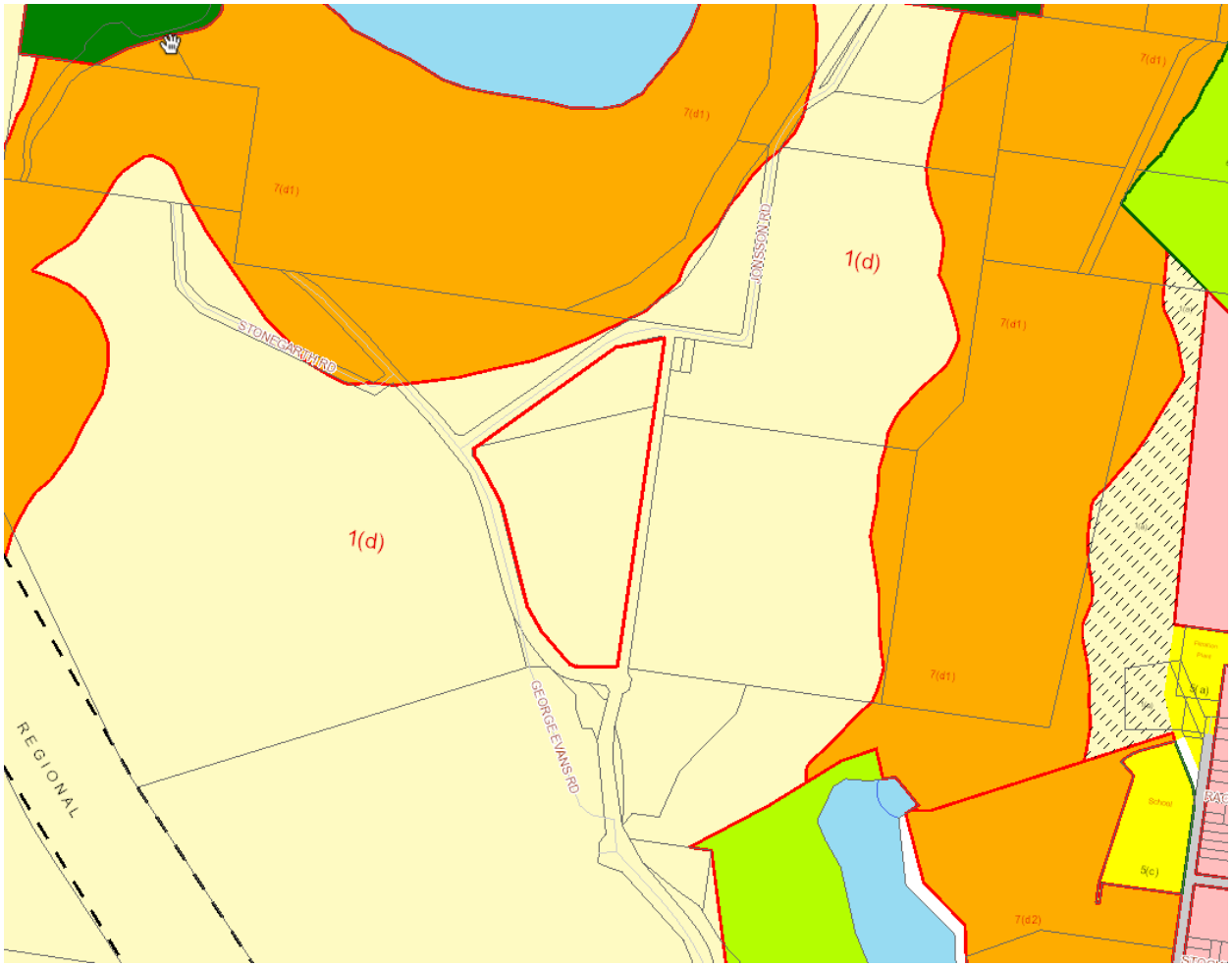

Figure 4.1: Zoning Plan – LEP 1985

4.5.2 Shoalhaven Draft Local Environmental Plan 2009

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 4.1. 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*.

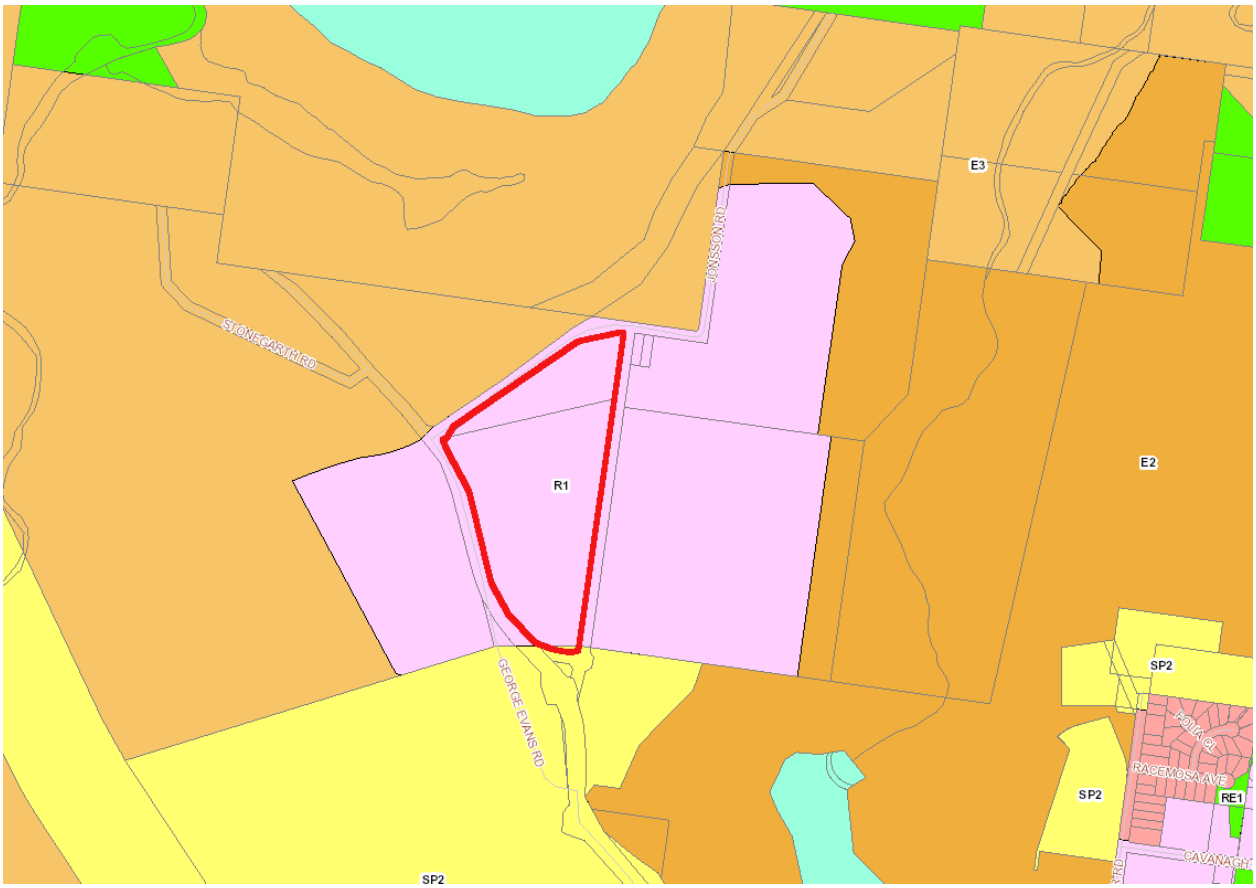

Figure 4.2: Zoning Plan – Draft LEP 2009

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.

Clause 5.5 Development within the coastal zone

The objectives of this clause are as follows:

(a) *To provide for the protection of the coastal environment of the State for the benefit of both present and future generations through promoting the principles of ecologically sustainable development;*

(b) *To implement the principles in the NSW Coastal Policy, and in particular to:*

  (i) *protect, enhance, maintain and restore the coastal environment, its associated ecosystems, ecological processes and biological diversity and its water quality; and*

(ii) protect and preserve the natural, cultural recreational and economic attributes of the NSW coast; and
(iii) provide opportunities for pedestrian public access to and along the coastal foreshore: and
(iv) recognise and accommodate coastal processes and climate change; and
(v) protect amenity and scenic quality: and
(vi) protect and preserve rock platforms, beach environments and beach amenity; and
(vii) protect and preserve native coastal vegetation; and
(viii) protect and preserve the marine environment; and
(ix) ensure that the type, bulk, scale and size of development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area; and
(x) ensure that decisions in relation to the new development consider the broader and cumulative impacts on the catchment; and
(xi) protect Aboriginal cultural places, values and customs; and
(xii) protect and preserve items of heritage, archaeological or historical significance.

Response:

This clause of the LEP 2009 must be addressed as the subject site is located approximately 400m from the Shoalhaven River and also falls within the 'coastal zone' for which SEPP 71 applies. As mentioned above in Part 4.3.4, although the proposal falls within the 'coastal zone', it is not located in a coastal/foreshore area. Regardless of this, an extensive study of the site has been completed to achieve the objectives and principles of SEPP 71 and Clause 5.5 of the LEP 2009. As outlined in Part 4.3.4 the proposal will have no detrimental impact to the local area in terms of public amenity, scenic quality, native vegetation, scale and size of the development, Aboriginal cultural places and heritage significance.

Clause 5.10 Heritage conservation

The objectives of this clause are:

(a) to conserve the environmental heritage of Shoalhaven; and

(b) to conserve the heritage significance of heritage items and heritage conservation areas including associated fabric, settings and views; and

(c) to conserve archaeological sites; and

(d) to conserve places of Aboriginal heritage significance.

(8) Places of Aboriginal heritage significance

The consent authority must, before granting consent under this clause to the carrying out of development in a place of Aboriginal heritage significance:

(a) consider the effect if the proposed development on the heritage significance of the place and any Aboriginal object known or reasonably likely to be located at the place; and

(b) *notify the local Aboriginal communities (in such a way as it thinks appropriate) about the application and take into consideration any response received within 28 days after the notice is sent*.

Response:

Navin Officer Heritage Consultants Pty Ltd were engaged to conduct an Aboriginal Heritage Assessment of the subject site in 2012 (Appendix 5). The assessment concluded that no aboriginal sites were recorded during the

study and there are no areas of predicted archaeological sensitivity within the study area. The assessment recommended that:

- No further archaeological investigations are necessary for the Mundamia residential subdivision project
- The protocols for the unanticipated discovery of archaeological material and suspected human remains be adopted and complied with during construction activities involving ground surface disturbance and excavation.

The Aboriginal Heritage Assessment outlines the 'Due Diligence Code of Practice" for protection of Aboriginal objects in NSW which must be carried out while conducting activities which may harm Aboriginal objects. The Code of Practice helps individuals and organisations to exercise due diligence when carrying out these activities. The Code sets out the steps to take in order to:

- Identify whether or not Aboriginal objects are, or likely to be present in an area;
- Determine whether or not their activities are likely to harm Aboriginal objects (if present); and
- Determine whether an AHIP application is required.

If Aboriginal objects are present or likely to be present and an activity will harm them, then an AHIP will be required. The assessment also outlines the appropriate protocols to follow in the event that Aboriginal objects or historical relics are encountered. The assessment also provides the protocols to follow should there be discovery of suspected human remains within the area.

Clause 5.11 Bush fire hazards reduction

A Bushfire Risk Assessment (Appendix 3) was carried out by SET Consultants Pty Ltd to assess the potential bushfire impacts and to outline what mitigation measure will be implemented to reduce the risk of bushfire. This is further discussed in Section 7.6 of this report.

Clause 7.10 Acid sulfate soils

(1) The objective of this clause is to ensure that the development does not disturb, expose or drain acid sulphate soils and cause environmental damage.

Response:

According to the Shoalhaven City Council State of the Environment (SCC SOE) online Acid Sulphate Map the site is classified as 'No known occurrence' of ASS. As part of the Geotechnical Assessment prepared by Martens and Associates (Appendix 9) fifteen soil samples were screened using field and oxidised pH. Initial pH results indicated a potential for ASS on site and additional laboratory analysis was undertaken. sPOCUS analysis was undertaken on all fifteen samples and results are presented Section 7.7 of this report.

An Acid Sulphate Soils (ASS) Management Plan will be prepared as part of the documentation to support a construction certificate application for Stage 1 construction. The ASS management plan will provide a framework for achieving environmental objectives in order to minimise the risk of harm to human health and the environment during and following the proposed development. The ASS management plan will outline the procedure for neutralisation the disturbed soil in order to minimise the potential for adverse environmental impact.

Records of monitoring and neutralisation activities (soil and leachate) will be maintained by a suitably qualified consultant. A final report will be issued upon completion of the works discussing the monitoring regime, the results obtained and hence confirm that adequate neutralisation treatment.

Due to assessment and consideration into the management of acid sulfate soils in the Contamination Assessment, the proposal is believed to achieve the objectives and requirements of Clause 7.10 of the Draft LEP.

4.6 Development Control Plans and Council Polices

4.6.1 Development Control Plan 2009 – Mundamia

The Mundamia Development Control Plan is yet to be drafted and assessment against this plan will be carried out prior to development approval.

4.6.2 Mundamia Masterplan 2008

The Mundamia urban release area masterplan planning principles are as follows:

1. *Provide a residential living area of unique character and ambiance which will provide a different choice to Worrigee and West Nowra.*
    - The proposed subdivision will provide a unique setting unlike any current residential area in the Shoalhaven. It will provide for modern low and medium density development with rural surroundings. Furthermore this release area will incorporate a village centre with an array of facilities and create a more urban character.

2. The rural landscaping along the University access road be extended via a major spine road (unformed crown road) through the sub-division to northern focal point at Thompson's Reserve.
    - Although extensive residential and commercial development is to take place within the subject site, a rural character is to be maintained. This is to be achieved through the use of landscaping predominantly along the major spine road (unformed crown road) which connects through George Evans Road and continues north through the subdivision towards Thompson's Reserve.

3. *Commercial Centre including a village shop, community hall and public open space be located on the major spine road towards the southern boundary of the properties, within walking distance of the University.*
    - The designated allotments for the commercial centre and public open space have been positioned on the major spine road (unformed crown road) as indicated on the subdivision layout plan. The commercial centre will be located approximately 400m north of the University.

4. *The passive open space is to be integrated with the major spine service road rather than "small pocket" reserves.*
    - Two largest open space lots, Lot 25 and 77, are 8644m^2 and 519m^2 respectively and are both positioned along or close to the major spine road. The remaining open space lot, Lot 90 is located off the spine road however is positioned along Jonsson Road.

5. *The major east/west collector road shown on the Nowra Bomaderry Structure Plan be incorporated as an APZ zone on the southern boundary of the site or not integrated.*

    - Any future collector road created is to be incorporated as an APZ or not integrated.

6. *The internal road layout and provision of services must allow each owner to develop independently.*

    - The road layout has been designed in a manner that allows each owner to development independently. All lots have been designed with their own street frontage access and there are no battle-axe lots proposed that may have restricted development controls imposed on them.

7. *Both high quality and affordable medium density be located in the vicinity of the commercial/community area within walking distance of the University.*

    - As indicated on the subdivision plan, all dual occupancy and medium density allotments have been positioned within close proximity to the commercial centre, in most cases adjacent to the centre, and are within walking distance on the University.

8. *The existing George Evans Road needs to be retained to provide access to the western residential sector and Jonsson Road to be included as an APZ perimeter road.*

    - George Evans Road is to be retained to provide access to the western sector of the site and will be upgraded along with Jonsson Road which will be an APZ perimeter road.

9. *The perimeter road around the total precinct to act as an APZ zone.*

    - As outlined in the Bush Fire Assessment (Appendix 3) the perimeter roads of George Evans Road and Jonsson Road provide APZs of 30m and 25m respectively.

10. *Ensure a bus route can circulate through the subdivision, starting and finishing at the Community/Commercial focal point.*

    - The road reserves of the subdivisions surrounding roads (George Evans Road, Jonsson Road and the spine road) are proposed at between 20-25m and the internal road reserves at 16m. These road widths will be suitable for the circulations of buses though the subdivision and services the community and commercial centre.

11. *As Council has contributed to the water and sewerage capacity, the Council land will be serviced first with spare capacity.*

    - Council documentation from 2000 verifies that the Planning Services Section of Council paid an amount for the construction of the Sewer Pump Station. It is understood that is still the case and that Council will be serviced first as a result of the contribution.

12. *The internal subdivision roads should provide rural views at end to the buffer zone.*

    - The subject site is predominantly surrounded by rural bush land especially to the north and west. The proposed street layout reinforces the existing settlement character of the locality and enhances the ecological urban form and visual characteristics. This street pattern provides views to the important natural features of the site and areas environs. The neighbourhood will afford views and vistas to Cambewarra Range and adjoining bushland. The bushland will provide a valuable natural setting for the neighbourhood and determine the local landscape character. An entry point into the neighbourhood will communicate a sense of arrival and contribute to neighbourhood identity.

13. *Solar access will need to be considered for all lots.*

    - Solar access for all proposed lots has been considered. Unfortunately even with the best subdivision design generally only 50% of blocks are going to be able to face north, which happens to be the case for this subdivision. Because of the shape of the subject site, many of the lots have been designed with an east-west orientation. The Mundamia DCP will specify controls for the residential development on these lots that will increase solar access for neighboring properties.

14. *Larger lots may be required on steeper slopes.*

    - There is a slight downwards depression in a northerly direction on the site. The steeper parts of the site are around the middle section where the larger medium density, open space and village centre lots are to be positioned.

15. *Easements will be required for existing services, including the water pipeline*.

    - The concept Water Plan (Attachment 4) indicates where the removal of the existing connection for the water main along Lot 473 DP 1102909. Two (2) new easements have been shown on the plan connecting from the existing water main and crossing over George Evans Road to service the water network throughout the subdivision.

16. *Pedestrian/bicycle paths should be strengthened along the major spine road.*

    - It is understood that the potential number of residents for the area would warrant the creation of a bicycle path. A pedestrian path is to be included within the road reserve along the spine road.

17. *The acquisition of land from the Department of Education needs to be undertaken for the main spine road during Stage 1.*

    - The acquisition of Lot 4 DP 1156684 from the Department of Education was carried out to created part of the main spine road and George Evans Road. The Deposited Plan has been registered.

18. *Staging and implementation of the subdivision should radiate from the central Commercial/Community focal point where possible.*

    - The commercial centre of the proposal is an integral part of the development and is required to be completed within the early stages of the overall development so as to cater to the lots created in this subdivision as well as those surrounding within the Mundamia area. As outlined earlier in Part 3.5 the commercial component of the proposal is to be completed along with Stage 4 of the development.

19. *Drainage should be dissipated rather than concentrated and downstream approvals need to be given for staging.*

    - The stormwater plan (Appendix 8) has been design to mitigate the impacts on downstream threatened ecosystems. The plan indicates the use of an OSD basin with an associated outlet headwall for pipe from basin 1 on the northern side and within the road reserve of Jonsson Road. This approach to the drainage generated from the development will dissipate all drainage water at a rate suitable for downstream conditions.

20. *Lot sizes need to be determined at master planning stage and relate to solar access, views, drainage.*

- The proposed lots sizes for all allotments have been shown on the subdivision layout plan. The design and position of all lots have taken into consideration solar access, views and drainage.

21. *Consideration to be given to architectural covenants over lots, to create a theme or standard.*
    - There have currently been no architectural covenants created for the proposed lots. It is expected that these will be stipulated in the new Mundamia DCP.

22. *The ultimate boundary of the precinct to be defined by diversity certification.*
    - Shoalhaven City Council no longer proposes biodiversity certification for adopted LEP 2009.

4.6.3 Nowra Bomaderry Structure Plan

The purpose of this structure plan is to provide a framework for the integrated development of the Nowra Bomaderry area. It looks at the implications of the ongoing growth of the urban area in the City of Shoalhaven. It assesses the need to balance this role with the need to conserve the significant environmental attributes of the area. Mundamia falls within the Nowra Bomaderry area for which this structure plan applies. Nowra Bomaderry is the dominant centre in the Shoalhaven with 40% of estimated retail expenditure of the Shoalhaven occurring in the Nowra CBD. Nowra Bomaderry provides approximately 60% of the employment within the Local Government Area.

Mundamia falls within the Rural South precinct which includes all the non-urban land to the south of the Shoalhaven River and has a total area of 9,063ha. The precinct accounts for 4% of the structure plan area's population and 3% of its dwellings. The precinct has a gross population density of 0.13 persons per hectare and 0.04 dwellings per hectare.

Population Predictions

The population of the Nowra Bomaderry area has experienced a steady increase over the last decade and has caused demand for further housing. The Nowra Bomaderry Structure Plan had projected future population rates using a 'cohort component model' which estimates futures population based on birth rate; survival rate; and net migration. The table below indicates the projected population rates within the different age groups. As shown here a significant increase in population sizes has been projected for the Nowra Bomaderry area. Such a large increase in population numbers triggers an obvious demand for additional housing within the area.

Age Group	2001	2006	2011	2016	2021	2026	2031	2036
Young Dependent (0-14)	7293	6933	6918	7622	8661	9669	10362	10885
Working Age (15-64)	18562	19746	21609	23400	24940	26915	29346	32232
Elderly Dependent (65+)	4312	5004	5780	6845	7911	9152	10065	10592
Total	30168	31683	34307	37867	41512	45736	49773	53709

Housing Demand

The demand for housing has traditionally been driven by the family household which currently accounts for 73% of all households in Nowra Bomaderry. Of the family households, couples with children have maintained their pre-eminence, although families comprising of couples without children have become more prevalent. The major growth sector has been the lone person household and this change has not been matched by the supply of dwellings. On the basis of the two decade trends in household formation, the demand for mainstream residential accommodation has been projected for 2036 and indicated in the table below. With the

increased demand for attached housing and unit/flat housing (medium density housing), the forecast shows a dramatic increase in these housing types over the next two decades.

Dwelling Type	2001	2006	2011	2016	2021	2026	2031	2036
Detached House	3289	3470	3752	4085	4432	4954	5528	6102
Attached House	4173	4544	5081	5728	6450	7221	8058	8893
Unit/Flat	3267	3781	4483	5347	6358	7132	7959	8784
Total	**10729**	**11795**	**13316**	**15160**	**17239**	**19308**	**21545**	**23779**

Nowra Bomaderry: Dwelling Type Demand Projection

This proposal will provide housing types that will meet the demand of medium density housing in the Nowra Bomaderry area and accommodate to those in group households and lone person households.

Urban Expansion Potential

Over a period of some 10 years the urban expansion potential of Nowra Bomaderry has been monitored, reviewed and evaluated. As a consequence, a detailed investigation of a number of candidate urban expansion areas has been undertaken as part of the structure planning process. As a consequence of Nowra Bomaderry's physical setting; straddling the Shoalhaven River; at the western edge of the coastal plain; and set amidst a natural and pastoral landscape that has significant inherent biodiversity and scenic values, the scope for urban expansion is highly constrained. The structure plan identified Mundamia as a potential new living area.

The data collected from the Nowra Bomaderry Structure Plan highlights the significant population growths and urban expansion forecasted for the area and the demand for housing, in particular medium density housing. This development caters to the predictions of the structure plan and will provide for future growths within the Nowra Bomaderry area.

New Living Areas

The Nowra Bomaderry Strategy identifies seven new living areas for future development. Existing characteristics and landscapes features form the basis from which the character of each neighbourhood will be development. Future subdivision and development of the new living areas will achieve the goals and objectives of this plan and are guided by design principles.

New Living Areas: Development Capabilities

New Living Area	Area ha	Density Dwells/ha	Dwellings No	Population No
Area 1: Moss Vale Road North	108.0	12/ha	1,300	3250
Area 2: Moss Vale Road South	99.3	12/ha & 15/ha	1,250	3125
Area 3: Bangalee Road West	16.3	12/ha	200	500
Area 4: Crams Road	89.9	12/ha	1080	2700
Area 5: Mundamia	53.0	12/ha & 20/ha	720	1800
Area 6: Cabbage Tree Lane	182.4	12/ha	2180	5450
Area 7: Worrigee	32.6	12/ha	390	975
Total	581.5		7120	17800

Area 5: Mundamia

Existing Considerations

- The land slopes gently down from a high point in the south. Beyond the boundary of the area, the land drops steeply at the cliff embankments of the Shoalhaven River and Flat Rock Creek.
- Clearing for agricultural use and previous gravel mining has occurred over part of the area.
- The area is substantially vegetated including: Scribbly Gum-Blue-leaved Stringybark Forest/Woodland, and an area of regenerating native vegetation.
- Several threatened species (flora and fauna) have been identified within the area.
- A small section of an unnamed creek extends into the north-eastern part of Area 5.
- George Evans Road extends north/south through the area, with a number of other unsealed roads and tracks.
- The adjoining land is predominantly vegetated and includes several threatened species. There are a number of watercourses in close proximity to the neighbourhood, being the Shoalhaven River, Flat Rock Dam, Flat Rock Creek, Cabbage Tree Creek and numerous tributaries into the creeks.
- Area 5 is in close proximity to the Nowra Campus of the University of Wollongong and Thompson's Point rock climbing area.

Desired Future Character

The neighbourhood of Mundamia will be a contained area of residential development to the west of Nowra, within an area of abundant native bushland. This is an asset to be preserved and protected as a significant part of the biodiversity and natural processes in the area. The neighbourhood will achieve a high level of environmental performance to ensure the quality of watercourses in close proximity to the neighbourhood, being the Shoalhaven River, Flat Rock Dam, Flat Rock Creek, Cabbage Tree Creek and numerous tributaries into the creeks.

The neighbourhood will afford views and vistas to Cambewarra Range and adjoining bushland. The bushland will provide a valuable natural setting for the neighbourhood and determine the local landscape character. An entry point into the neighbourhood will communicate a sense of arrival and contribute to neighbourhood identity. Residential development will consist of a mix of medium density and detached dwellings.

A grid based street layout will provide a connected movement system, and include a wide main street running north/south from the neighbourhood entrance. The neighbourhood is in close proximity to the Nowra campus of Wollongong University and Thompson's Point rock climbing area. Opportunities for linkages between these areas will be developed through convenient movement and access and the provision of services and facilities

within the neighbourhood such as small scale commercial activities and short term accommodation for visitors and students.

Residential Capacity

Approximately 720 dwellings

Planning & Design Principles

The neighbourhood will achieve a considered balance between urban development and the protection of environmentally significant areas. Threatened species and valuable ecological communities will be retained and protected through appropriate land use zones, continuous riparian corridors, and stormwater and drainage management. The natural bushland adjoining the neighbourhood will be conserved. The local landscape character of the neighbourhood will be enhanced by retaining existing vegetation within open spaces, road reserves and on individual lots, where appropriate. Planting local native species in open spaces, streets and private gardens will also contribute to the local landscape character.

View corridors along streets will provide long distance views of the Cambewarra Range and adjoining bushland. Views from along the Shoalhaven River to the steep river embankments and native vegetation will be presented by providing a treed buffer between the neighbourhood and the river.

An entry point into the neighbourhood will create a sense of arrival and place. A grid based street layout is required that is predictable, easy to navigate (legibility) and move through (permeability), and maximizes north/south facing lots (optimizing the potential to minimise energy use). George Evans Road (off Yalwal Road) will provide vehicle access to the neighbourhood and connections to the University and Thompson's Point rock climbing area will be maintained.

Access points for pedestrians and cyclists to the adjoining bushland will be formalized to clearly define access routes. In some instances it will be necessary to restrict public access to adjoining areas that are environmentally significant.

Meet current planning requirements for coastal land, threatened species and potential natural hazards.

Response

As outlined in the proposal and Mundamia Masterplan, the subject release area also includes the subdivision and development of adjoining Lot 473 DP 1102909, Lot 384 DP 755952 and Lot 3 DP 568613. The study area measures approximately 71ha in total and it is the intention of Council and all landowners that the development of all existing individual lots result in a linked residential/commercial network.

It is envisaged that the scale of development for Mundamia will result in some 720 dwellings in detached and medium density housing. The strategy for the area also identifies a future high school in the area. The proposed subdivision is consistent with these forecasts and it is believed that it will benefit current and future residential, commercial and educational projections.

The proposal aims to achieve the desired future character for Mundamia:

- As indicated on the Flora & Fauna Assessment (Appendix 2) the proposal has recognises the significance of the native bushland as an asset to the areas biodiversity and natural processes. It is the intention of the proposal to minimise potential impacts on the existing natural environment and achieve a high level of environmental performance to ensure the quality of surrounding habitats and

watercourses. As such the Flora & Fauna Assessment has set out a number of impact mitigation and amelioration strategies have been recommended for the proposal. These strategies mitigate the effects of the proposal on threatened species, endangered populations, ecological communities, or their habitats and minimise the impacts of the proposal on the flora and fauna values of the study area in general.

- As outlined in the proposal, the development seeks to integrate the areas existing landscape and natural setting. Although large portion of existing vegetation is to be removed to accommodate a mixture medium density and detached dwelling, all surrounding vegetation outside of the development area is to be retained to provide for a natural setting. This setting will be made evident at the entry point to the neighbourhood where the proposal seeks to establish the areas identity.
- The proposal has incorporated a street layout that will benefit residents and visitors to the area. With surrounding facilities and attractions such as the university campus and Thompson's Point rock climbing, as well as future facilities such as a commercial centre, linkages between these areas have been provided through an appropriate street network. The proposed 'Spine Road' with a road reserve of 25m runs north/south through the middle of the release area dividing Lot 1 DP 1021332 and Lot 384 DP 755952. This road will establish the entry point of the neighbourhood and serve the commercial centre as well as a link between internal roads.

The proposal will be carried out in accordance with the appropriate planning and design principles:

- As outlined above the proposal aims to minimise any potential impacts on environmentally significant area. Proposed mitigation measures within the Flora & Fauna Assessment will work towards achieving a balance between the urban development and the protection of the environmentally sensitive area. The subject land is to be rezoned from rural to residential as part of the new Shoalhaven LEP 2009. This rezoning is to allow for the subdivision and development of the area, however the majority of the surrounding land will maintain an environmental management zoning which will impose the appropriate controls and policies so that these environmentally significant areas are not detrimentally affected. A Stormwater Management Assessment (Appendix 8) has been carried by Martens Consulting Engineers Pty Ltd which identifies how existing watercourses will be protected and maintained and how stormwater runoff created will be managed. As previously mentioned, where possible the development seeks to retain and conserve as much of the existing native vegetation to enhance the landscape character of the neighbourhood.
- The proposal provides opportunities for long distance views of the Cambewarra Range and adjoining bushland to the immediate north of the site. Surrounding lots to be development will also benefit from adjoining bushland predominantly to the east and west. The vegetation to the north of the site will be retained and act as a buffer between the neighbourhood and the Shoalhaven River.
- As discussed above a sense of arrival and character of the neighbourhood will be established at the entrance and the street layout has incorporated a grid based design to enable legibility and permeability. As indicated in the Traffic Impact Assessment (Appendix 4) a street layout has been designed so as to link with the surrounding sites within the release area and provide a flowing connection between the whole neighbourhood.
- Access points across the subject area will be provided and clearly defined for pedestrians and cyclists. This will include access throughout the release area providing linkage around the neighbourhood. Where necessary access restrictions will be enforced to surrounding areas that are of environmental significance.
- The relative planning requirements for coastal land, threatened species and potential natural hazards have been addressed throughout the report.

4.7 Draft Coastal Zone Management Plan (2012)

Council has prepared draft Coastal Zone Management Plan for the Shoalhaven Coastline (CZMP) to identify sustainable ways to manage coastal hazards and protect the values of our coastline. The coastline of Shoalhaven City Council is 165 kilometres long, extending from Shoalhaven Heads to Durras. The CZMP provides details on the management of twenty one (21) beaches along the coastline.

The plan covers a range of issues, including:

- Making progress towards integrating the management of coastal zone issues into a comprehensive package for the open coast, estuaries, bays and headlands;
- Engaging local communities in the management of their beaches and other areas in the coastal zone, including the right balance between access, visual appeal, dune stabilisation and protection of native vegetation;
- Implementing fair and effective planning controls so that new development takes into account immediate and longer term coastal hazards and risks, and supporting appropriate protection for existing development that is likely to be affected by coastal erosion now;
- Improving community capacity to respond to erosion and flooding emergencies caused by coastal storms;
- Enhancing coastal biodiversity by controlling weeds and feral predators, as well as appropriate fire management and access management;
- Incorporating coastal risks into planning for infrastructure replacements and upgrades, including beach access ways and major assets such as sewerage reticulation and pump stations; and
- Implementing adaptive management to reduce uncertainty and maintain best practice.

The CZMP provides guidance on how the issues will be dealt with, who is responsible, where funding will come and when actions are scheduled to be undertaken.

Response

The subject site while located within the Shoalhaven Coastal zone is located outside of the area directly covered by the management plan. The subject site will indirectly drain into the Shoalhaven River which discharges adjacent to Shoalhaven Heads. The proposed development has been designed and incorporates an environmentally sustainable water management strategy which incorporates the following water sensitive urban design principles as to ensure no adverse impact on downslope areas in terms of increased peak discharge rates and pollutant loads.

Stormwater System Design:

- Rainwater tanks located on each lot (including medium density residential and commercial lots) to capture roof runoff for non-potable uses such as toilet flushing and irrigation.
- Roadside bioremediation swales located on one side of single cross-fall roads designed to treat stormwater flows from roads and lots, provides surface conveyance of flows to downslope treatment measures and provide areas for landscape planting.
- Site pit and pipe network pits and pipes designed to adequately convey the design peak storm event to site stormwater management measures.
- Gross pollutant traps located upstream of OSD and wetlands to capture gross pollutants.
- Wetlands located within OSD basins to further treat stormwater flows.
- OSD basins to capture stormwater flows from site areas and attenuate post-development peak discharges.

The proposed development will not affect the ability of the relevant stakeholders in achieving the objectives of the CZMP.

4.8 Shoalhaven River Estuary Management Plan (2008)

The Estuary Management Plan presents an integrated suite of management actions to ensure that the important natural, economic and social values of the Shoalhaven River estuary and its coastal floodplain are enjoyed and protected both by current residents and visitors and by future generations.

The estuary management plan is part of the package of natural resource management strategies to protect these significant values, and has the overall purpose of:

- Protecting the natural resources of the estuary;
- Establishing agreed management priorities for the estuary;
- Co-ordinating efforts by agencies and community groups in the management of the
- estuary; and
- Obtaining funding for implementation of important management activities.

The Shoalhaven Estuary Management Plan is structured around four major management themes, each of which incorporates multiple management issues. The four themes have been chosen to facilitate understanding of the major factors contributing to the successful management of the estuary:

- management integration and co-operation;
- morphodynamics;
- biodiversity; and
- productivity and community enjoyment.

Response

The Estuary Management Plan is broken up into eight management zones based on a combination of morphodynamic and land use planning factors. The subject site while located within the catchment of the Shoalhaven River is located outside of the area directly covered by the management plan. However, the subject site will indirectly drain into the Shoalhaven River, within Zone 2: Long Point to Bomaderry Creek junction. The reach of the River has moderately high recreational use, and periodic very high recreational use. The sheltered waters are favoured by water ski clubs, but are also used for non powered recreational boating and fishing. This reach also includes the main urban settlements of Nowra and Bomaderry. Both centres are characterised by ongoing and potential growth as well as changing demand for waterfront recreational access. There are also some localised water quality issues associated with existing stormwater and waste management practices (Shoalhaven City Council).

While the proposed development will result in the removal of vegetation from the area, it will not result in the removal of any riparian vegetation. Furthermore, the water management strategy and landscaping has been designed to minimise impact on surrounding vegetation, specifically the Spring Tiny Orchid and the Nowra Heath Myrtle located outside of the subject site and promote biodiversity through careful plant selection throughout the subdivision and integration of landscaped bioswales and water sensitive urban design.

The proposed development has been designed and incorporates an environmentally sustainable water management strategy which incorporates the following water sensitive urban design principles as to ensure no adverse impact on downslope areas in terms of increased peak discharge rates and pollutant loads.

Stormwater System Design:

- Rainwater tanks located on each lot (including medium density residential and commercial lots) to capture roof runoff for non-potable uses such as toilet flushing and irrigation.
- Roadside bioremediation swales located on one side of single cross-fall roads designed to treat stormwater flows from roads and lots, provides surface conveyance of flows to downslope treatment measures and provide areas for landscape planting.
- Site pit and pipe network pits and pipes designed to adequately convey the design peak storm event to site stormwater management measures.
- Gross pollutant traps located upstream of OSD and wetlands to capture gross pollutants.
- Wetlands located within OSD basins to further treat stormwater flows.
- OSD basins to capture stormwater flows from site areas and attenuate post-development peak discharges.

The proposed development will not affect the ability of the relevant stakeholders in achieving the objectives of the Estuary Management Plan.

4.9 Contributions – Section 94 and Section 64 Urban Residential

Section 94 Contributions are to be dealt with via a Voluntary Planning Agreement as per discussions with Shoalhaven City Council. On 26 March 2013 it was motioned that Council give in principle agreement to the preparation of a planning agreement to enter into an agreement. Council committed to writing to all land owners within the Mundamia Release Area seeking their commitment to enter into a planning agreement to provide for the essential community infrastructure associated with the development of the area being at a minimum:

i. Contributions towards external traffic improvements;
ii. Realignment and construction of George Evans Road to provide access to the URA;
iii. Central Open Space within the URA;
iv. A community centre! child care centre within the URA;
v. Any works associated with drainage measures to protect ecologically sensitive areas;
vi. Contributions towards citywide and planning area wide contributions projects i.e. sports fields etc.

The Section 64 Contributions are yet to be calculated. The amount to be paid for all associated infrastructure will be further discussed once infrastructure planning for the proposal has been finalised.

5 CONSULTATION

5.1 Consultation with Stakeholders and Other Relevant Authorities

5.1.1 Statutory and Other Relevant Authorities

SET Consultants Pty Ltd has had ongoing correspondence with Shoalhaven City Council, the Nowra Local Aboriginal Land Council and the Department of Planning & Infrastructure for the proposal, particularly in relation to the South Coast Regional Strategy, Mundamia Masterplan Principles and objectives of the Nowra Bomaderry Structure Plan.

There has also been correspondence with the relative State Government agencies requesting their input for the proposal. The majority of the government agencies have sent acknowledgment of the proposal or provided comment. The following State Government agencies were contacted:

Office of Environment and Heritage (formally DECC)

Correspondence (Attachment X) was received post lodgment of the draft Environmental Assessment on 21/01/13. The letter from OEH outlined a number of issues that were to be addressed in the final report including; Subdivision Design and Layout; Biodiversity Assessment; and Aboriginal Heritage.

The Office of Environment and Heritage (OEH) has provided detailed comments against the relevant DGR requirements. OEH comments are shown italic below, the comments have been broken up into separate issues to allow for a concise response to each issue.

1. **Subdivision Design and Layout *DGRs Requirement Section* 2.2 – "***Clarify the proposed street layout and residential development boundary, including any areas* of *vegetation to be cleared, and demonstrate that it is consistent with the Nowra- Bomaderry Structure Plan, particularly with respect to DECC's submission dated* 27 *March 2009".***

(A) The Flora and Fauna Report for site identifies that the proposal is likely to involve the removal of all native vegetation and habitats on Lot 1 (Page 1). This includes the intact Scribbly Gum/ Bloodwood woodland that occupies the northern portion of the site identified in the DECC 2009 submission as potential HCV woodland. It hard to see how this is consistent the Planning and Design principles requirements of the Nowra- Bomaderry Structure Plan for the Mundamia area which states the character of the neighbourhood will be enhanced by retaining existing vegetation within open spaces.

Response:

The proposal is to clear all the vegetation on the site to allow for the efficient development of the subdivision. The subject site requires a lot of earthworks in relation to the removal of contaminated fill, importation of fill material and regrading the site. Therefore the removal of the vegetation will allow soil material on site to be utilised in the overall site regrading works. The site will be revegetated in accordance with the Landscape Master Plan provided in Attachment 12.

While it is acknowledged that OEH has identified potential HCV woodland in the northern section of the subject site, a site specific flora and fauna assessment has been undertaken by Ecological Australia to assess the impact of the removal of this vegetation. Ecological found that the affected area of Scribbly Gum – Bloodwood Woodland is relatively intact, but has been degraded to some extent by previous landuse in the area. The area

has been separated and isolated from adjoining vegetation by clearing for agriculture, roads, power easements and quarrying operations. The Scribbly Gum – Bloodwood Woodland is relatively widespread in the Shoalhaven, with an estimated 11,218 ha, the majority of which is protected in reserves or by other land zoning. The loss of 4.3 ha of Scribbly Gum – Bloodwood Woodland in this context is relatively minor and acceptable.

Ecological concluded "that the north eastern portion of the subject site contains more intact and less disturbed fauna habitats within the Scribbly Gum-Bloodwood Woodland. These habitats to be removed include a variety of widespread and common foraging and sheltering resources, a few terrestrial termitaria and 38 moderately-sized hollow-bearing trees. While hollow-bearing trees are an important sheltering and/or breeding resource for a range of fauna, no species of conservation significance were recorded using this resource in the study area, and none are considered likely to on a regular basis. Hollow-bearing trees are relatively widespread in surrounding areas, with BES (2004a) recording 274 trees with hollows in the wider Mundamia study area".

An assessment of significance under Section 5A of the EPA Act was undertaken on those species with potential to occur on the site or otherwise be affected by the proposal. The outcome of this assessment was that the development is unlikely to significantly impact those threatened fauna species assessed. Provided that effective measures to mitigate and manage indirect impacts to nearby *Pterostylis vernalis* and *Triplarina nowraensis* habitat are implemented as part of the proposal, it is unlikely that the development would significantly impact threatened flora species.

The fauna habitats to be removed for the proposal are all relatively widespread in surrounding areas and while utilised by a moderate range of species, do not appear to provide important resources for fauna of conservation significance.

While OEH states *it is hard to see how this is consistent the Planning and Design principles requirements of the Nowra- Bomaderry Structure Plan for the Mundamia area which states the character of the neighbourhood will be enhanced by retaining existing vegetation within open spaces.* The Planning and Design principles requirements of the Nowra- Bomaderry Structure Plan for the Mundamia area states*:*

"The neighbourhood will achieve a considered balance between urban development and the protection of environmentally significant areas. Threatened species and valuable ecological communities will be retained and protected through appropriate land use zones, continuous riparian corridors, stormwater and drainage management. The natural bushland adjoining the neighbourhood will be conserved. The local landscape character of the neighbourhood will be enhanced by retaining existing vegetation within open spaces, road reserves and on individual lots, where appropriate. Planting local native species in open spaces, streets and private gardens will also contribute to the local landscape character".

While the proposal will remove all the existing vegetation from the subject site, we disagree with OEH and believe that the proposal is consistent with the overall Planning and Design principles requirements of the Nowra- Bomaderry Structure Plan for the Mundamia area. The New Living Area: 5 Mundamia Figure (Map 2.7, Page 22) within the Nowra- Bomaderry Structure Plan clearly shows the areas outside and surrounding the identified URA as the Conversation and Riparian Areas. This is supported by the Draft LEP which identifies the area surrounding the URA except for the University as Environmental Protection Zones (E2 and E3). Furthermore, the Natural Resource Sensitivity - Biodiversity Map Sheet in the Draft LEP does not show any Sensitive area - significant vegetation or Sensitive area - habitat corridors within the subject site. The proposed development also incorporates an environmentally sustainable water management strategy which incorporates the water sensitive urban design principles to ensure no adverse impact on downslope areas in terms of increased peak discharge rates and pollutant loads. The landscape master plan has been designed

to; maximise landscaping in all streets with native trees have been included in all streets; and promote biodiversity through careful plant selection throughout the subdivision and integration of landscaped bioswales and water sensitive urban design.

(B) *The detail of the report is misleading in this regard as the EA states on Page X of the EA Executive Summary that, "The subdivision layout has been designed to protect a large portion of the existing natural environment, and to reinforce the street pattern within the local area. "and on pg 19 of the EA that "The subdivision layout completes the existing road network while protecting the ecologically sensitive parts of the site." The current design for the subdivision, however, does not conserve any of the higher quality native vegetation in the north-east corner of the site and thus these statements appear inconsistent with the proposed layout. This area contains large numbers of hollow bearing trees that provide habitat for threatened species. Similarly, with the proposed contiguous street plan for the neighbouring subdivision in the Mundamia Masterplan (Lot 3 DP568613 and Lot 384 DP55952), a large portion of the vegetation requested to be excluded from the development footprint in DECC 2009 letter on that site will not be retained.*

It appears the approach taken in the report, despite the above statements, is the native vegetation and habitat should be retained in the adjoining land to fulfil the requirements of environmental protection. The recommendations of the Flora & Fauna Assessment has set out a number of impact mitigation measures, particularly in Section 5 of the report that Consideration should be given to more formal protection of nearby land containing species and habitats of conservation significance, such as conservation agreements, protective land zoning and/or transfer to the DECCW reserve system. This approach is inadequate, and, the report contains no detail how this is to be achieved, nor any commitment to achieve this. This issue is discussed further in the offsetting comments below.

Response:

It is acknowledged that some of the wording in the EA was incorrect as it was based on an earlier design. The EA has been amended and theses statements have been removed. The north-eastern portion contains 38 moderately-sized hollow-bearing trees which are proposed to be removed as part of the development. While hollow-bearing trees are an important sheltering and/or breeding resource for a range of fauna, no species of conservation significance were recorded using this resource in the study area, and none are considered likely to on a regular basis. Hollow-bearing trees are relatively widespread in surrounding areas, with BES (2004a) recording 274 trees with hollows in the wider Mundamia study area. An assessment of significance under Section 5A of the EPA Act was undertaken on those species with potential to occur on the site or otherwise be affected by the proposal. The outcome of this assessment was that the development is unlikely to significantly impact those threatened fauna species assessed.

The recommendation within the Flora and Fauna Report that “Consideration should be given to more formal protection of nearby land containing species and habitats of conservation significance, such as conservation agreements, protective land zoning and/or transfer to the DECCW reserve system” is consistant with the Planning and Design principles for the Mundamia area within Nowra- Bomaderry Structure Plan stating that “Threatened species and valuable ecological communities will be retained and protected through appropriate land use zones, continuous riparian corridors, stormwater and drainage management. The natural bushland adjoining the neighbourhood will be conserved”.

2. ***DGRs requirement Section* 9.1** *Prepare* a *Flora and Fauna assessment Report in accordance with the Draft Guidelines for Threatened Species Assessment (DEC, DPI, July 2005) and the Threatened Species Assessment Guidelines: The Assessment* of *Significance (DECC Aug 2007), addressing potential impacts* of *the development on the flora and fauna* of *the site and setting in the landscape, particularly impacts on any threatened species where known. Surveys should target the Triplarina nowraensis and the assessment should demonstrate that the proposal will have minimal impact on this species. Provide measures for the conservation* of *flora and fauna, habitats and communities, where relevant, including the provision* of *adequate vegetated buffers, particularly on the eastern side bordering the Flat Rock Creek Gully.*

   Survey techniques- OEH considers that in general the survey methods for both flora and fauna have been adequate for this particular site (LOT 1 DP568678 DP 1021332 & Part LOT 458 DP1 063107) to make an informed decision on the test of significance for threatened species and their habitats. One area that could have been improved on in the report is the assessment of the threatened terrestrial orchids that could potentially occur on the site. The targeted survey methods for these species should have been written up with more detail. It is inadequate to identify such species as Leafless Tongue Orchid *Cryptostylis hunteriana,* Bauer's Midge Orchid *Genoplesium baueri,* Spring Tiny Orchid *Pterostylis vernalis* (Flat Rock Creek) on site on the basis of random meander searches as stated on Page 7 EcoLogical Flora and Fauna Report. This method is unlikely to readily locate these small and cryptic species It is noted elsewhere it is stated that transects at 10 metre intervals where carried for the more intact sections of the site (Figure 3). However, overall OEH is satisfied that these threatened orchid species are unlikely to occur on site with the absence of suitable habitat of open sites on shallow sandy soil and moss gardens around the margins of sandstone sheets and Kunzea Shrubland.

Response:

While expressing satisfaction with the outcome, OEH comment was made on the adequacy of threatened orchid survey techniques. It is acknowledged that more information regarding survey methods could have been provided in the report, but we would argue that the survey methods used were entirely effective for each species targeted given the site attributes. The random meander searches were only used in poorer quality habitat to supplement the target parallel transects surveys 5-10 metres apart throughout suitable habitat.

The Methodology in the Ecological Report states:

"Parallel transect surveys for the threatened Leafless Tongue Orchid Cryptostylis hunteriana and Bauer's Midge Orchid Genoplesium baueri were undertaken in December 2009 and February 2010 respectively. Surveys were undertaken following confirmation of flowering at known populations in the general area. The surveys involved searching for the species along parallel transects 5-10 metres apart throughout suitable habitat in the study area, supplemented by random meander searches of poorer quality habitat within the study area.

Searches for the Spring Tiny Orchid Pterostylis vernalis (Flat Rock Creek) were undertaken on 17 June 2012, following confirmation of leaf rosettes appearing at nearby populations. Targeted searches of potentially suitable habitat (moss or shallow soil under patches of White Kunzea Kunzea ambigua) were undertaken within the subject site, although most of the potential habitat for this species had been derived from regrowth after quarrying operations".

3. ***DGRs Requirement Section 9.2*** *Address the potential bio-certification of the Draft Shoalhaven Comprehensive LEP 2009. Any native vegetation proposed to be removed within the area identified by DECC (see letter dated at Attachment 4) needs to be offset in accordance with the principles of 'maintain or improve ' environmental outcomes.*

The legislative provisions of the TSC Act under-pinning Bio-certification were amended in July 2010, and now bio-certification is not conferred on LEP's, but for specified areas of land. There is therefore no current proposal to confer bio-certification on the Draft Shoalhaven Comprehensive LEP. Nevertheless, OEH considers that the principle of 'improve or maintain' is important, and has consistently requested during this process that the intact areas of vegetation in the northern part of the site be retained as per the map attached to letter dated 27 March 2009 referred to above. In addition to key areas being retained, all native vegetation proposed to be cleared should be offset, with an offset plan being documented by the proponent in the EA. The following approach should be applied:

- The quantum of offset should preferably be determined by the proponent using
- appropriate methodology such as the Biobanking Assessment Methodology (BBAM) See OEH website for details: http://www.environment.nsw.gov.au/biobanking/.
- This would likely result in an offset area being more than 5 times as large as the area cleared. The offset should be "like-for-like", i.e., a comparable outcome based on the same vegetation type, the same threatened species present and located within the same region. OEH requires offsets to be managed under effective and secure long term management arrangements.

OEH acknowledges that an offset is unlikely to be able to be located within the subject site given the current proposed development footprint occupies the entire subject area. Therefore the proponent, in coordination with the developer of (Lot 3 DP568613 and Lot 384 DP55952) might wish to consider jointly locating offsets in the remaining area of the Mundamia Masterplan to the west of George Evans Road.
Alternatively, the footprint of the proposed development should be reduced, with areas retained in the northern part of the site being used to offset losses elsewhere on this site. OEH would be willing to discuss possibilities for offsets in greater detail with the proponent.

Response:

We strongly disagree with OEH position that all the native vegetation proposed to be cleared from the northern section of the site should be required to be offset. The subject site has been identified in the Nowra Bomaderry Structure Plan and Draft Shoalhaven LEP 2009 as part of the Mundamia Urban Release Area to be rezoned to Residential R1. As part of the process to investigate the appropriate extent of the proposed Mundamia new living area, BES (2004a, 2004b) undertook extensive flora and fauna surveys of the Mundamia area to identify ecological attributes and areas of high conservation value. This information allowed Council to amend the boundaries of the Mundamia new living area at the Structure Plan stage to ensure the highest conservation values would be excluded from future development areas. The boundaries of the Mundamia URA contained in the NBSP, was endorsed by the South Coast Regional Strategy. Furthermore, the Natural Resource Sensitivity - Biodiversity Map Sheet in the Draft LEP does not identify any Sensitive area - significant vegetation or Sensitive area - habitat corridors within the subject site.

It is acknowledged that OEH has made a number of submissions to the Nowra Bomaderry Structure Plan and Draft Shoalhaven LEP 2009 requesting Council refine the boundaries of the Mundamia URA to remove the northern portion of the subject site from the URA. However, to date Shoalhaven City Council and the Department of Planning have supported the current boundaries of Mundamia URA. Council confirmed their support for the current boundaries in a Special Development Committee Meeting held on Thursday 12 April, 2012 where Councillors unanimously supported to the retain the exhibited zone boundaries and lot sizes for

the Mundamia URA. Furthermore, the Department of Planning and Infrastructure supported the re-exhibition of the Draft LEP (currently on exhibition) with the current zone boundaries.

The DGRs clearly state that a Flora and Fauna assessment Report should be prepared in in accordance with the Draft Guidelines for Threatened Species Assessment (DEC, DPI, July 2005) and the Threatened Species Assessment Guidelines: The Assessment of Significance (DECC Aug 2007). The flora and fauna assessment prepared by Ecological Australia and provided in Appendix 2 was undertaken in accordance with these guidelines.

This report assesses the potential impacts on threatened and migratory species, endangered populations and ecological communities of the proposal to subdivide Lot 1 DP 1021332 and part Lot 458 DP 1063107 George Evans Road, Mundamia, as part of a new residential living area. The assessment concluded following the application of the Section 5A of the EPA Act and in accordance with relevant assessment guidelines, that the proposal is unlikely to have a significant effect on threatened species, endangered populations, ecological communities, or their habitats, provided that effective measures are undertaken to control, monitor and manage indirect impacts of the proposal on nearby habitats of conservation value.

It needs to be made clear that the development of this site for a residential purpose has been assessed has part the Mundamia Masterplan, the Nowra- Bomaderry Structure Plan and the Draft Shoalhaven LEP 2009, all of which have been supported by Council and the Department of Planning and Infrastructure. The Planning and Design principles for the Mundamia area within Nowra Bomaderry Structure Plan recognise the vegetation on the land surrounding the identified residential zone (URA) will need to be conserved to mitigate the impact of the URA. The Nowra Bomaderry Structure Plan makes it clear that this will be achieved through appropriate land use zones, which is evident within the Draft LEP identifying the area surrounding the URA except for the University of Wollongong land as Environmental Protection Zones (E2 and E3).

We have undertaken a site specific assessment of the site and believe the removal of vegetation in the north section of the site is acceptable without the need to provide offsets. We request that the Department of Planning take a practical approach to the assessment of the removal of vegetation from the site and consider the strategic planning for the site and the history of the environmental assessment undertaken to define the existing URA boundaries.

4. ***DGRs Requirement Section 9.3*** *Resolve the provision of arterial road access for the proposal and any impacts on threatened species assessed using the 'avoid, mitigate or offset' framework.*

   OEH considers that this has not been adequately assessed under the EA. The Ecological Fauna and Flora Report states the upgrading and realignment of George Evans Road beyond Lot 1 will be assessed separately and is not considered part of the proposal for the purposes of this report. Under the current proposal some vegetation in area of land directly south of the proposed subdivision (Lot 4 DP1156584) is set to be cleared for the re-alignment of George Evans Road and the installation of a roundabout which acts as the entrance to the new urban area. This area of the proposed road construction has not been adequately surveyed as was not included in the 'subject area' of the Flora and Fauna Assessment. The proponent cannot therefore fully assess impacts on threatened species without surveying this area as this road construction is integral to the construction of the subdivision. Based on Figure 4 in the Flora and Fauna Assessment OEH considers the area is disturbed and unlikely to contain threatened species, populations or communities but vegetation removed for this road construction must be offset. Both the offset for this clearing and the clearing discussed at 9.2 above must be determined prior to approval of the development proposal.

Response:

The re-alignment and construction of George Evans Road does not form part of this proposal, and therefore has not been assessed.

Shoalhaven City Council - Strategic Planning section obtain subdivision approval (DA09/1519) for the realignment of George Evans Road on 28 June 2010. As part of that application a Flora and Fauna Assessment and a Heritage Assessment was undertaken and assessed by Council.

DP1156684 which created the road reserve for the realignment of George Evans Road was registered on 6 May 2011. The closing as road of Lots 3 & 4 was gazetted on 20 May 2011 and these lots were transferred to Minister for Education in exchange for Lots 1, 2 & 5 which are now dedicated public road and in Shoalhaven City Council Ownership.

Approval for the construction of arterial road would therefore be assessed under Part 5 of the Environmental and Assessment Act 1979. Shoalhaven City Council will be required to prepare and assess a Review of Environmental Factors in relation to the potential environmental impacts. However, DA09/1519 for the road realignment was granted with the following restrictions:

The following shall be created as restrictions-as-to-user under Section 88B of the Conveyancing Act, 1919:

- Removal of hollow-bearing trees on the land affected by this consent is to be carried out so as to avoid the known breeding periods for threatened hollow - dependant fauna.
- The loss of tree-hollows is to be minimised and/or offset by appropriate design, selective tree retention, the installation of replacement nest-boxes and/or the salvage of tree-hollows and their re-use in areas to be set aside for biodiversity conservation purposes.
- To reduce the possibility of death or injury to hollow obligate native fauna the following Tree Removal Protocol is to be implemented prior to and during the clearing of the affected by this consent:
- Removal of all understorey vegetation from the area. The site must be left in this state for a period of 48 hours to encourage hollow-obligate species to disperse to new areas;
- Removal of all non hollow-bearing trees from the site at least 48 hours prior to the removal of the hollow-bearing trees to further encourage the dispersal of fauna; and
- The felling of hollow-bearing trees is to be carried out wherever possible using the soft drop technique whereby an excavator is used to slowly lower the tree to the ground under supervision of an appropriately qualified fauna consultant or wildlife carer. Any fauna species exiting the hollows should be caught if possible and released into adjacent bushland or shepherded into adjoining habitat
- In preparing the Instrument setting out the terms of easements and restrictions affecting this land, ensure that such restrictions cannot be varied, modified or released without the consent of the necessary parties involved and without the consent of the Shoalhaven City Council, where appropriate.
- Except those required by Council, the final plan and associated instruments shall not contain restriction, that prohibit development allowed under the relevant environmental planning instruments applicable to the site.

5. ***DGRs Requirement Section* 9.4** *Outline measures for the conservation of existing wildlife corridors and/or connective importance of any vegetation on the subject land. Investigate opportunities to conserve or enhance local and regional corridors and important habitats, such* as *creek lines, in the design of the proposal.*

   OEH considers that the suitability of the site for urban development has been primarily addressed during the development of the Nowra-Bombaderry Structure Plan, which identified key corridors in the region. However, within the subject land, key areas of vegetation are proposed for removal, without any offset proposed.

Response:

The Natural Resource Sensitivity - Biodiversity Map Sheet in the Draft LEP does not identify any Sensitive area - significant vegetation or Sensitive area - habitat corridors within the subject site. There are no creek lines present within the subject site. The landscape master plan has been designed to; maximise landscaping in all streets with native trees included in all streets; and promote biodiversity through careful plant selection throughout the subdivision and integration of landscaped bioswales and water sensitive urban design. Our position of the provision of offsets has been provided in response to Issue 3 above.

6. **Aboriginal Heritage**

   OEH advises it cannot currently comment on the adequacy of the Aboriginal cultural heritage assessment provided for this project as it appears that the assessment has not followed the guidelines outlined in the Director General's Environmental Assessment Requirements (DGEARs) as issued on 13 April 2009.

   The DGEARs issued in relation to Heritage and Archaeology for this project state:

   8.1 Identify whether the site has significance to Aboriginal cultural heritage, the nature and extent of any impacts, and appropriate measures to preserve any significance. The assessment must address the information and consultation requirements of the draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation (DEC 2005) and Interim Community Consultation Requirements for Applicants (DEC 2004)

   Contrary to the DGEARS outlined above, Section 1.3 of the report titled Mundamia Subdivision, Nowra, NSW: Aboriginal Archaeological Assessment (dated December 2012) states that the Project assessment was undertaken following the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010). This appears to be inconsistent with the DGEARs which state the requirements of the draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation (DEC 2005) and Interim Community Consultation Requirements for Applicants (DEC 2004) must be addressed.

   It should be noted that Section 4.2 and section 7 of the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales specifically outline the requirement for activities declared as a Part 3A project under the Environment Planning and Assessment Act 1979 (EP&A Act) to refer to the 2005 (draft) Part 3A EP&A Act Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (as amended from time to time).

As such, the Aboriginal Archaeological Assessment should reference the Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation (DEC 2005) and ensure it complies with the requirements of that assessment process as it relates to the part 3A project.

OEH notes that the DGEARs seem to imply that Aboriginal consultation is also required as part of the assessment process regardless of the outcomes of any archaeological assessment. Whilst consultation may not change the outcome of the current assessment, there may be some additional local cultural knowledge and information about Aboriginal cultural heritage values of the area that can only be obtained through the Aboriginal community consultation process. OEH is therefore concerned about the adequacy of the current assessment to meet the DGEARs in terms of identifying significant Aboriginal cultural heritage values of the project area as a result of community consultation and providing any management measures that may be subsequently required as a result of community consultation.

***Response**:*

The Aboriginal Archaeological Assessment is in the process of being amended to address the Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation (DEC 2005). An updated draft report dated April 2013 is provided in Appendix 5. The following work has been undertaken to date and a revised report will provided to all relevant stakeholders once the consultation process has been completed.

Stage 1 of the consultation requirements commenced 2 April 2013. Letters were sent out to the following groups requesting an expression of interest for the proposed Mundamia subdivision:

- Nowra Local Aboriginal Land Council;
- Office of the Registrar;
- National Native Title Tribunal;
- Shoalhaven City Council; and
- Office of Environment and Heritage.

Closing date for expressions of interest is 16 April 2013.

Following advice received from OEH, letters were sent to:

- Nowra Local Aboriginal Land Council;
- Walbunja Aboriginal Corporation;
- Yuin Traditional Owner Mr Mongta;
- South East Coast Gado Elders Aboriginal Corporation;
- Jerrinja Consultants Pty Ltd;
- Jerrinja Local Aboriginal Land Council; and
- Shoalhaven Elders and Friends Organisation.

The closing date for expressions of interest was 7 May 2013.

An advertisement was placed in the Public Notices section of the South Coast Register on 10 April 2013. Closing date for expressions of interest was 24 April 2013.

Shoalhaven City Council

Land owner meeting with Council and NLALC were held 28/10/09; 12/11/09; 28/07/11 and 13/12/11. The following Shoalhaven Council offers were consulted during the preparation of the Environmental Assessment report:

- Brett Williams
  Transport Engineer
- Elizabeth Dixon
  Senior Environmental Planner
- Cinnamon Dunsford
  Senior Strategic Planner
- Tony Fraser
  Subdivisions Manager
- Ljupco Lazarevski
  Systems Development Engineer
  Shoalhaven Water

Shoalhaven Water

As per Attachment 20 correspondence was received on 21/01/13. Shoalhaven Water outlines that they were currently reviewing its water supply and sewerage servicing systems. The letter also indicates that the future water supply will be a requirement for the developer and should be provided as part of the water reticulation system for the Mundamia area.

Furthermore Shoalhaven Water added that with respect to the sewerage servicing the current Sewerage Servicing Development Servicing Plan (DSP) proposes a new sewage pumping station (SPS) in the north-eastern corner of the URA. This new SPS is intended to serve the lands that can gravitate to it. This work was originally planned for *2016/17.*

Department of Primary Industries

As per Attachment 18 correspondence was received on 23/03/09. The Department of Primary Industries outlined a number of issues that were recommended to be addressed including:

- Description of all aquatic environments (watercourses, wetlands) located on the site or adjacent to the site and their regional significance.
- Predictions of any impacts upon aquatic environments on or adjacent to the site (both temporary and permanent).
- Safeguards to mitigate any impacts upon aquatic environments and riparian habitats (e.g. full details and widths of any proposed riparian buffer zones).
- Predictions of any impacts upon water quality and aquatic threatened species, populations and ecological communities listed under the *Fisheries Management Act 1994* (both temporary and permanent).
- Safeguards to mitigate any impacts upon water quality, including impacts downstream into Flat Rock Creek and the Shoalhaven River. This should include full details of proposed effluent management, stormwater, road drainage and water quality management for the site (e.g. description and locations of

on-site wastewater systems, swales, water quality retention ponds etc.) and if relevant details of proposed acid sulphate soils management.

- Predictions of any impacts of sea level rise and coastal inundation on the proposed development and proposed safeguards to mitigate any impacts.
- Details confirming that the proposed development is fully consistent with the South Coast Regional Strategy.

NSW Office of Water

As per Attachment 17 correspondence was received on 16/01/13. The NSW Office of Water requested the following key issues to be addressed

- Compliance with the rules in any relevant Water Sharing Plan (WSP) and legislation.
- An assessment of the impact of the proposal on watercourses, riparian areas, wetlands, groundwater sources and groundwater dependent ecosystems.
- Adequate mitigating and monitoring requirements to address impact to surface water and groundwater sources and dependent ecosystems.

Department of Crown Lands

As per Attachment 15 correspondence was received on 12/12/12. The Department of Crown Lands outlined that a road closing application for the part closed Crown road, nor has approval been given by the Department under the provisions of the Roads Act 1993 for the construction of the adjoining land. As per discussions with the landowners, Shoalhaven City Council, they are currently in negotiations with the Department of Crown Lands for the road closure and construction of the adjoining land.

NSW Police Service

A letter was sent to the NSW Police Service at the time of writing this report and no correspondence was received.

State Emergency Services

As per Attachment 19 correspondence was received on 04/12/12. The SES outlined that the matters raised for the proposal were receiving attention.

Department of Education and Communities

As per Attachment 18 correspondence was received on 12/12/12. The Department of Education & Communities outlined that they do not oppose to the development.

Department of Sustainability, Environment, Water, Population and Communities

Correspondence (Attachment 9) was received on 20/08/12 which outlined that the following measure must be taken to avoid significant impacts listed threatened species and communities:

- A stormwater recharge infiltration system as part of the construction phase of the development
- Design of infrastructure including roads and other structures must ensure that they do not impede, redirect or otherwise modify current off-site groundwater drainage patterns.

Rural Bushfire Service

The proposed subdivision satisfies the acceptable solutions contained within Planning for Bushfire Protection 2006, therefore it was determined that consultation with the RFS was not necessary during the preparation stage of the Environmental Assessment Report.

Department of Defence

Mr Brenin Presswell (Assistant Director, External Land Planning, Estate Planning Branch Infrastructure Division, Department of Defence) was contact via phone and emails on a number of occasions to discuss the proposal. The Department of Defence was provided with a briefing paper on 16 October 2009 and 6 October 2012 outlining the proposed development. The Department did not raise any concerns or issues with the proposed development. The Department provided a copy of the HMAS Albatross Military Aircraft Operating Areas map and the HMAS Albatross Nowra NSW 2014 ANEF Summary Report.

Mr Brenin Presswell was also contacted by Carl Fokkema of Atkins Acoustics & Associates during the preparation of the Noise Impact Assessment in relation to the schedule of flights and the table of noise levels for HMAS Albatross.

6 ISSUES IDENTIFICATION

6.1 Methodology

The following site investigations and reports have been prepared as part of the risk assessment analysis conducted in the preparation of this Environmental Assessment. The aim of this analysis was to identify all key environmental risk factors relevant to the project, so they could be appropriately managed and taken into consideration during the design of the subdivision layout. The results and recommendations of the analysis are discussed in Section 7.

- Flora and Fauna Assessments, prepared by Eco Logical Australia Pty Ltd, 2012 (Appendix 2);
- Bushfire Protection Assessment, prepared by SET Consultants Pty Ltd, 2012 (Appendix 3);
- Traffic Impact Study, prepared by Bitzios Consulting Pty Ltd, 2012 (Appendix 4);
- Aboriginal Archaeological Assessment, prepared by Navin Officer Heritage Consultants Pty Ltd, 2012 (Appendix 5);
- Hydrological Assessment, prepared by Martens Consulting Engineering Pty Ltd, 2011 (Appendix 6);
- Contamination Assessment, prepared by Martens Consulting Engineering Pty Ltd, 2012 (Appendix 7);
- Stormwater Management Assessment, prepared by Martens Consulting Engineering Pty Ltd, 2012 (Appendix 8);
- Geotechnical Assessment, prepared by Martens Consulting Engineers Pty Ltd, 2012 (Appendix 9);
- Noise Assessment, prepared by Atkins Acoustics Pty Ltd, 2012 (Appendix 10);
- Remedial Action Plan, prepared by Martens Consulting Engineers Pty Ltd, 2013 (Appendix 11)

7 ENVIRONMENTAL IMPACT ASSESSMENT

While a large proportion of Mundamia and the surrounding area is currently vegetated in native vegetation, population growth and the need for infrastructure are putting increasing pressure on developable land, which will result in the clearing of some native vegetation communities. It is acknowledged that measures need to be taken to avoid ecologically unsustainable impacts on biodiversity and negative environmental impacts. This chapter discusses the potential environmental impacts of the proposed subdivision and the mitigation measures, which have been recommended and incorporated into the subdivision layout design to minimise those environmental impacts.

7.1 Water Cycle Management

7.1.1 Existing Environment

Martens Consulting Engineers Pty Ltd were engaged to prepare a Stormwater Management Plan (Appendix 8). The results and recommendations of the Stormwater Management Plan are used in the following section.

The closest water bodies to the site are the Shoalhaven River and Flat Rock Creek which are located 580m north and 1.6km west of the site respectively. Furthermore as the site is located on a sandstone escarpment, the relief from the development site to receiving waters is steep. The water from the site would therefore need to be discharged over/through the adjoining properties before either being discharge into the Shoalhaven River to the north or Flat Rock Creek to the east.

Previous site use as a quarry / gravel pit has reshaped the natural site surface. The site falls to its centre which consists of a flat (slopes <5%) exposed sandstone surface. Drainage is facilitated by a manmade channel that runs north and exits the site under Jonsson Rd.

Site groundwater conditions are described as follows:

- Groundwater was observed in one test pit (TP108) and moist soil conditions reported in test pits located in the site's south.
- All other boreholes and test pits provided no indication of groundwater prior to termination depth.

A hydrogeological assessment for the Mundamia urban release area was completed by Martens and Associates in February 2011 (Martens ref: P1002761JR01V02). Two groundwater monitoring wells GMB2 (south) and GMB4 (north) were installed on the site as part of this study (Figure 2). The following is summarised from the 4 month well monitoring period:

- GMB2 was saturated above the soil/rock interface for the whole of the monitoring perid.
- GMB4 remained dry above the soil/rock interface throughout the whole of the monitoring period. This is expected given that the silty gravely layer above the rock is highly permeable.

Given the site geological characteristics, ephemeral (temporary) groundwater is likely to occur in regions of the site's south in less permeable soils (sandy clay fill). A shallow (<2m) permanent groundwater table is not expected on site.

7.1.2 Potential Impacts

It is acknowledged that the construction of the proposed subdivision with the removal of vegetation and the addition of impervious areas will alter the natural vegetation and infiltration characteristics of the catchment. This in turn will cause the catchment to have a much higher surface flow component (runoff), which will increase the erosion potential of the surface water and also increase the amount of water entering the natural creeks. The activities associated with the urbanisation of the site such as the use of motor vehicles and the use of fertilizers could also create water quality problems due to pollutants entering the surface runoff. During a storm event, land surfaces, including impervious surfaces, are washed clean by the rainfall and the resulting runoff creates an increased loading of pollutants to receiving streams. The principal types of pollutants found in urban runoff from these various sources include:

- Sediment
- Oxygen-demanding substances (organic matter)
- Nutrients (Phosphorus, Nitrogen)
- Heavy metals (Copper, Lead, Zinc, Others)
- Pesticides
- Hydrocarbons (PAHs, Others)
- Temperature
- Trash/debris

7.1.3 Mitigation Measures

The stormwater management objectives adopted for this development are broadly defined as:

- Provide comment and recommendation for likely on-site stormwater detention (OSD) requirements.
- Provide recommendations for on-site stormwater quality measures to ensure compliance with identified performance objectives.
- Provide preliminary details of stormwater infrastructure to drain the site via water quality controls and OSD basins.

Performance objectives are specified to generally comply with Shoalhaven City Council's (1999) Engineering Design Specification and Sustainable Stormwater Guideline. The principles of Water Sensitive Urban Design (WSUD) and Ecologically Sustainable Development (ESD) are also applied in the concept design with respect to sensitive flora downslope of the site. Objectives are summarised as follows:

- Post-development discharge rates are not to exceed the rate of discharge for existing conditions for a range of storms up to and including the 1 in 100 year ARI.
- Site OSD is designed to limit the post-development peak discharges to existing peak discharges for frequent events (1 in 3 month to 1 in 1 year ARI storm events) which have the greatest effect on vegetation.
- Site minor system (pit and pipe network) to convey 1 in 10 year ARI peak storm event. Site major system to convey 1 in 100 year ARI peak storm event.
- Site stormwater management system to achieve minimum target groundwater recharge rates to ensure existing seepage rates are maintained. Previous hydrogeological studies showed that a minimum of 125 m2/ha of site recharge area is required.
- Post-development water quality outcomes are to be maintained as near as possible to pre-development condition to minimise impacts on native vegetation, whilst also adhering to the objectives for pollution retention listed in Table 1.

Martens and Associates Surface Water Hydrology Assessment (2011): This document provided a previous assessment of surface water hydrology and hydrogeology and recommendations made in this document are considered pertinent to this study. Notably the following recommendations with respect to maintenance of existing surface stormwater and groundwater regimes:

- Stormwater runoff from site roofs to be directed to rainwater tanks on individual lots for non-potable re-use purposes. Minimum volume of rainwater tanks to be 5 KL.
- Stormwater runoff from lot areas be directed to bioremediation 'raingardens' located on each lot. Raingardens are to have a minimum filter area of 125 m2/ha and a filter depth of 0.3 m.
- Stormwater runoff from site road reserves and lots is to be directed to bioremediation basins with a minimum filter area of 125 m2/ha (with catchment area measured excluding lot areas) to ensure groundwater recharge for downslope ecosystems.
- That the stormwater system be designed to maintain existing stormwater flows and nutrient loads where possible to minimise possible adverse impacts on sensitive flora located downslope of the development site.
- That OSD basins / tanks be utilised to ensure that peak post-development stormwater flows are reduced to existing peak discharges, particularly for more frequent storm events.

Components of the site concept stormwater management system are:

- Rainwater tanks located on each lot (including medium density residential and commercial lots) to capture roof runoff for non-potable uses such as toilet flushing and irrigation.
- Roadside bioremediation swales located on one side of single cross-fall roads designed to treat stormwater flows from roads and lots, provides surface conveyance of flows to downslope treatment measures and provide areas for landscape planting.
- Site pit and pipe network pits and pipes designed to adequately convey the design peak storm event to site stormwater management measures.
- Gross pollutant traps located upstream of OSD and wetlands to capture gross pollutants.
- Wetlands located within OSD basins to further treat stormwater flows.
- OSD basins to capture stormwater flows from site areas and attenuate post-development peak discharges.

The above measures are sized through iterative hydrological, hydraulic and water quality modelling. Design takes account of requirements for groundwater recharge determined in the hydrogeological assessment. Further mitigation measures and recommendations are provided in Martens Consulting Engineers Pty Ltd Stormwater Management Plan (Appendix 8)

7.2 Noise and Vibration

7.2.1 Existing Environment

Atkins Acoustics Pty Ltd were engaged by SET Consultants to conduct a Noise Assessment for the proposed development. Ambient noise levels were measured and recorded from 8 November 2012 to 16 November 2012. Measurements were conducted at two (2) reference locations to represent the northern and southern portions of the rezoning area (Appendix 1). Location 1 (north) was approximately 20m from the centre of Jonsson Road and Location 2 (south) approximately 15m from the George Evans Road.

Site observations, ambient measurement results and review of the Traffic Impact Study confirm that Jonsson Road and George Evans Road carry very low volumes of traffic, with the ambient noise environment influenced by natural elements, birds, insects and distant road traffic noise from Yalwal Road.

The measurements taken confirmed an ambient noise environment typical of an isolated natural area with low background L_{A90} and ambient L_{Aeq} noise levels with limited human activity. Considering the low noise levels, design and development of the neighbourhood shops, community centre and child care will require consideration to ensure that residential properties are not adversely impacted.

A review of the L_{AMAN} and L_{A1} noise levels has not identified any events that are typical of aircraft operations from HMAS Albatross. Identified peak events are likely to be as a result of occasional vehicle or motorbike pass by, or from birds or insects in close proximity to measurement positions.

Additional information has been provided by the Department of Defence in order to specifically address fixed wing aircraft and helicopters that utilise HMAS Albatross and including typically training routes. The Department of Defence confirmed that Lockheed C-130H Hercules utilise the facility along with SeaHawk and Squirrel helicopters.

7.2.2 Potential Impacts

The proposed development has the potential to impact on the noise and vibration amenity of the local community in the following ways:

- Noise and vibration associated with the earthmoving equipment during the construction phase;
- Increase in the amount of traffic movement (large vehicles) during the construction phase;
- Noise and vibration associated with the construction of dwellings;
- Increase in ambient background noise levels associated with an increase in the number of people living in the local area; and
- Increase in the amount of traffic movement as a result of the increase in the number of people living in the local area.

The subject site also has the potential to be affected itself by existing factors. The site is located more than 5km to the northern extent of Runway 03/21C at HMAS Albatross. A review of the 2014 ANEF for HMAS Albatross confirms the rezoning site is located outside of the 20 ANEF, accordingly there are no specific planning restrictions applicable under Table 2.1 of AS2012:2000.

A review of the operational procedures for HMAS Albatross confirm normal procedures would not result in direct flyovers, however the assessment has considered a reduced sideline distance of 1000m to account for an altered flight path in addition to consideration of Circuit Training Operations utilising a centreline distance of 7500m and sideline distance of 0m.

7.2.3 Mitigation Measures

The proposed development will generally have minimal impact on the noise level of the local environment. The majority of the noise associated with the development will be generated during the construction phase. This noise will be a temporary inconvenience and is expected to be subject to time constraints by way of relevant hours of operation in the development consent. It is foreseen that the future noise level generated by the proposed development will be similar to existing residential areas nearby, and will be regulated by relevant

state legislation and policies for residential living. The increase in houses with surveillance to the public reserve will also assist with self-policing of behaviour and unlawful use of the reserve area.

Although the proposal is foreseen to cause minimal impact and have a minimal impact imposed on it, certain mitigation measure will need to be enforced to reduce these impacts further. Noise reductions of 20dB (Rw26) are required to be achieved for dedicated lounges and sleeping areas to minimise aircraft noise. This can be achieved with single glazed 6mm glass installed in acoustic rated frames with acoustic seals. In regards to road traffic noise the assessment also discusses the increase of building setbacks or acoustic barriers are not feasible, therefore building noise controls have been considered. Exposed windows and doors of dwellings on the 'Spine Road' would be specified with acoustic performances of not less than Rw28 which is typically achieved again with single glazed 6mm glass installed in acoustic rated frames with acoustic seals.

7.3 Air Quality

7.3.1 Existing Environment

The Shoalhaven region in general has an excellent level of air quality, well above both current and proposed standards. The subject site is currently un-developed and predominately comprises native vegetation. The current air quality within the subject site would be considered excellent.

7.3.2 Potential Impacts

Potential air pollution in an urban area can arise from a wide variety of sources although they are mainly a result of combustion processes. The combustion of fossil fuels for transport, heat and electricity generation can result in the emission of significant amounts of pollutants including suspended particulate, which are made up of a combination of airborne smoke, soot, dust, and liquid droplets. However, the largest source of pollution in most urban areas is motor vehicles.

The proposed development has the potential to impact on the air quality of the local community in the following ways:

- The removal of native vegetation;
- Fugitive air emissions (dust) associated with the earthmoving equipment during the construction phase;
- Increase in the amount of traffic movement (large vehicles) during the construction phase;
- Increase in the amount of air pollution associated with the increase in the number of people living in the local area; and
- Increase in the amount of traffic movement as a result of the increase in the number of people living in the local area.

7.3.3 Mitigation Measures

The proposed development will generally have a minimal impact on the air quality of the local environment. The following points are made with regards to mitigation of air pollution:

- The majority of the fugitive air emissions will occur during the construction phase. An erosion control and dust suppression plan will be prepared and provided as part of the documentation for a construction certificate for the proposed development.

- All future dwellings constructed within the proposed subdivision, will be required to satisfy the BASIX SEPP requirements.
- The proposed development will result in an increase in traffic movement of 550 vehicle movements per day. This is considered to be a relatively small increase in the overall traffic movements of the local area.

7.4 Aboriginal Heritage

7.4.1 Existing Environment

Navin Officer Heritage Consultants Pty Ltd were engaged to conduct an Aboriginal Heritage Assessment of the subject site in 2012 (Appendix 5). The Aboriginal Heritage Assessment outlines the 'Due Diligence Code of Practice" for protection of Aboriginal objects in NSW which must be carried out while conducting activities which may harm Aboriginal objects. The Code of Practice helps individuals and organisations to exercise due diligence when carrying out these activities. The Code sets out the steps to take in order to:

- Identify whether or not Aboriginal objects are, or likely to be present in an area;
- Determine whether or not their activities are likely to harm Aboriginal objects (if present); and
- Determine whether an AHIP application is required.

If Aboriginal objects are present or likely to be present and an activity will harm them, then an AHIP will be required.

The assessment also outlines the appropriate protocols to follow in the event that Aboriginal objects or historical relics are encountered. The assessment also provides the protocols to follow should there be discovery of suspected human remains within the area.

The assessment concluded that no aboriginal sites were recorded during the study and there are no areas of predicted archaeological sensitivity within the study area. The assessment recommended that:

- No further archaeological investigations are necessary for the Mundamia residential subdivision project
- The protocols for the unanticipated discovery of archaeological material and suspected human remains be adopted and complied with during construction activities involving ground surface disturbance and excavation. Champagne

7.5 Flora and Fauna

7.5.1 Existing Environment

Eco Logical Australia Pty Ltd were engaged by SET Consultants to prepare a Flora and Fauna Assessment (Appendix 2). The proposal is concentrated on an area substantially degraded by previous quarrying activities that generally provides poor or marginal habitats and resources for flora and fauna species. The removal of vegetation from the subject site will not substantially affect habitat connectivity in the area nor increase fragmentation given the disturbances within and surrounding the site. The extent of habitat or vegetation to be removed is considered a minor impact in the context of the available resources in the locality.

As a result of database searches, literature review and field studies, the following species were considered likely to occur in the subject site and/or could be affected by the proposal. The potential impact of the proposal on these species has been assessed under relevant legislation. The threatened and migratory species with the potential to occur in the study area or to be affected by the proposal are listed in Table 7.1 below.

Table 7.1: Flora & Fauna communities present on the subject site
(Source: Eco Logical Pty Ltd Flora & Fauna assessment 2012)

Scientific Name	Common Name	Occurrence
Triplarina nowraensis	Nowra Heath Myrtle	Nearby
Pterostylis vernalis *Pterostylis* sp. Flat Rock Creek	Spring Tiny Greenhood	Nearby
Calyptorhynchus lathami	Glossy-black Cockatoo	Known
Callocephalon fimbriatum	Gang-gang Cockatoo	Potential
Ninox strenua	Powerful Owl	Potential
Lophoictinia isura	Square-tailed Kite	Potential
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Potential
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	Potential
Mormopterus norfolkensis	East Coast Freetail Bat	Potential
Pteropus poliocephalus	Grey-headed Flying-Fox	Potential
Scoteanax rueppellii	Greater Broad-nosed Bat	Potential
Petaurus australis	Yellow-bellied Glider	Potential
Varanus rosenbergi	Rosenberg's Goanna	Potential

7.5.2 Potential Impacts

Native vegetation will be cleared to develop the subdivision and to establish hazard reduction areas to protect the subdivision from bushfire. The Bushfire Protection Assessment for the proposed development undertaken by SET Consultants Pty Ltd indicates that APZs ranging from 16m to 25m, consisting predominately of Inner Protection Area (IPA) are required.

Eco Logical Pty Ltd conducted an assessment of significance under Section 5A of the EPA Act on those species with potential to occur on the site or otherwise be affected by the proposal. The outcome of the assessment was that it is unlikely that the development would significantly impact on those threatened fauna species assessed. Provided that effective measures to further investigate, mitigate and manage indirect impacts to nearby *Pterostylis ventricosa* and *Triplarina nowraensis* habitat arimplemented as part of the proposal, it is unlikely that the development would significantly impact on threatened flora species. The seven-part test completed by Eco Logical Pty Ltd outlined the proximity and potential impact the proposal may have on the abovementioned species as discussed below.

***Pterostylis vernalis* (Spring Tiny Orchid)**

The Spring Tiny Orchid does not occur within the subject site, but its proximity to the site and potentially sensitive habitat makes it susceptible to indirect impacts from the development. The species is known to occur within 300m to the west and south east of the site. Potentially suitable habitat (Kunzea Shrubland) also occurs within similar distances to the north and north-west of the site. These areas have not been comprehensively surveyed for the species, so the full extent of its occurrence in the Mundamia area is not known. Populations of the species are small and appear restricted to preferred microhabitats, which are often associated with Kunzea Shrubland fringes.

There is potential for the species to be indirectly affected by the proposal by polluted stormwater runoff, changes to groundwater quality or flow regimes, weed invasion, altered fire regimes and other disturbances resulting from the establishment of a new residential area. While there are inherent risks to populations of the species posed by the development, there are also reasonably sized buffers of native vegetation between the development and orchid habitat, and the potential for indirect impacts to be effectively managed and controlled.

The proposal needs to be designed to minimise adverse hydrological impacts to surrounding habitats and incorporate measures to protect nearby habitats of conservation significance from the indirect effects of a new residential centre.

Provided that the development can incorporate effective strategies to manage the range of indirect impacts likely to be associated with it, the proposal is unlikely to have an adverse effect on the life cycle of this species, such that a viable local population would be placed at the risk of extinction.

***Triplarina nowraenis* (Nowra Heath Myrtle)**

Triparina nowraensis has not been recorded from the current study area (despite targeted surveys by BES (2004a)), and no suitable occurs there. It has, however, been recorded in substantial numbers around the periphery of the Mundamia urban land release area (BES 2004a). The species is known to occur within 100m of the northern boundary of the current study area, and about 250m to the west of the study area.

The proposal will have no direct impact on the species and will maintain substantial vegetated buffers (>100m) to known occurrences. However, there is potential for the species to be indirectly affected by the proposal by polluted stormwater runoff, changes to groundwater quality or flow regimes, weed invasion, altered fire regimes and other disturbances resulting from an increased human population. The proposal needs to be designed to minimise adverse hydrological impacts to surrounding habitats and incorporate measures to protect nearby habitats of conservation significance from the indirect effects of a new residential centre.

With the above measures, and considering the relatively large numbers of plants that would constitute the viable local population of the Mundamia study area, the proposal is unlikely to have an adverse effect on the life cycle of this species, such that a viable local population would be placed at the risk of extinction.

Yellow-bellied Glider

The north of the study area provides some foraging resources for the Yellow-bellied Glider, and possible denning resources in larger hollow-bearing trees. The species is known to occur in the Mundamia area, with BES (2004a) recording 98 incised feed trees, mainly around the periphery of the Mundamia urban release area. No incised feed trees were located within the current study area by BES or ELA. On one occasion, BES (2004a) heard one Yellow-bellied Glider from the northern edge of the current study area, close to Jonsson

Road, which indicates the species may use the more intact northern parts of the study area for at least foraging. The Yellow-bellied Glider was not recorded in the study area during targeted surveys by ELA, but was heard calling to the north of Jonsson Road.

Surveys suggest that the study area may be used by the Yellow-bellied Glider on occasions for foraging, but does not represent good quality habitat. Of the 39 hollow-bearing trees recorded in the study area, only a very low number would be potentially suitable for use by the glider, and no evidence of den tree use has been recorded in the study area. The heavily disturbed subject site contains only marginal habitat for the species and it is unlikely to use the site given the much higher quality habitat in the area.

The proposal is not expected to remove anything but marginal or unsuitable habitat for the Yellowbellied Glider and the species is known to persist in close proximity to residential areas. The proposal is unlikely to have an adverse effect on the life cycle of this species, such that a viable local population of the species would be placed at the risk of extinction.

Glossy Black-cockatoo

The study area provides foraging habitat for the Glossy Black-cockatoo, with 12 feed-trees (Black Sheoaks) showing evidence of feeding by the species (BES 2004a). Recent feeding evidence was noted under a few of the feed-trees during ELA fieldwork. Black She-oaks are scattered through the study area and surrounding landscape. BES (2004a) recorded a total of 47 Glossy Black-cockatoo feed-trees in the Mundmaia urban land release area.

Few of the hollow-bearing trees in the study area would be suitable as nest sites for the species, and none are considered high quality or likely nesting resources. Targeted nesting assessments by BES (2004a) found no evidence of Glossy Black-cockatoo nesting in the current study area or the surrounding Mundamia urban land release area. The species is not expected to use the study area for nesting.

The proposal is likely to remove approximately 10 Glossy Black-cockatoo feed-trees, along with scattered Black She-Oak trees within the development footprint and 11 hollow-bearing trees that are very unlikely nesting resources for the species. Given the very large home range of the species, its high mobility and extent of suitable and better quality habitat in the surrounding landscape, the proposal is unlikely to have an adverse effect on the life cycle of this species such that a viable local population would be placed at the risk of extinction.

Gang-gang Cockatoo

The study area provides potential foraging habitat for the Gang-gang Cockatoo through the seeds of eucalypt and large wattles. A few of the hollow-bearing trees may provide potential, although unlikely, nesting resources. The species is known from the general area, but prefers taller forest habitats. The Gang-gang Cockatoo has not been recorded in the current study area by BES (2004a) or during recent nesting assessments by ELA. While the species could forage in the study area on occasions, the habitats there are of lower quality or marginal for this species.

The proposal would remove a relatively small area of marginal foraging habitat and a few tree hollows that provide very unlikely nesting resources for the species. It is unlikely that the proposal will have an adverse effect on the life cycle of this species such that a viable local population of the species would be placed at the risk of extinction.

Powerful Owl

The study area contains some low quality foraging habitat for the Powerful Owl, but no suitable roosting or breeding habitat. While the species is known from the Mundamia area, it has never been recorded from the current study area and is unlikely to occur there apart from possibly using the site for occasional foraging as part of a much larger home range.

The proposal would remove around one hectare of relatively low quality potential foraging habitat and is very unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species would be placed at the risk of extinction.

Square-tailed Kite

The study area contains potential foraging habitat for the Square-tailed Kite, mainly in the north where vegetation is relatively intact, but no potential nesting habitat. The species was observed foraging in the Mundamia area by BES (2004a), but has not been recorded in the current study area. As the generalised foraging habitat is common and widespread in the locality and the species forages over a very large area, the proposal will not have an adverse effect on the life cycle of this species such that a viable local population of the species would be placed at the risk of extinction.

Microchiropterans

The study area provides some potential foraging habitat for a range of threatened insectivorous bat species, including the Eastern Bent-wing Bat, Little Bentwing Bat, East Coast Freetail Bat, Eastern False Pipistrelle and Greater Broadnosed Bat, Yellow-bellied Sheathtail-bat and Large-eared Pied Bat. All of these species could forage in and around the site from time to time. The subject site does not provide optimal foraging habitat due to the extent of previous disturbances. Some of the 39 hollow bearing trees in the study area could provide roosting resources for hollow-dependant species, although no evidence of bat roosting was found during targeted stagwatching and echolocation recording surveys by BES (2004a) or ELA.

The proposal would remove sub-optimal to marginal foraging resources for these species and approximately 11 trees containing hollows. Given the infrequent use of the study area by these species, the sub-optimal to marginal foraging and roosting habitat within the subject site, the extent of suitable and higher quality resources in the surrounding area, the mobility and large home range of these species, the impacts of the proposal on these species is expected to be minor or negligible.

The proposal is unlikely to have an adverse effect on the life cycle of these bat species (i.e. impacts on breeding habitat) such that a viable local population would be placed at the risk of extinction.

Grey-headed Flying-fox

The study area provides suitable foraging habitat for the species in the larger eucalypt trees and banksias, although this habitat is far from optimal given its structure, species composition and disturbance history. The study area contains no suitably roosting resources. The species is known from the area and occurs throughout the region. It has not been recorded in the study area by BES (2004a) or during recent surveys by ELA, suggesting that there are no important foraging resources in the study area.

The species may pass through the study area and forage there on occasions, although the removal of a relatively small area of marginal foraging habitat is considered a negligible impact to this species. The proposal is very unlikely to have an adverse effect on the life cycle of the Grey-headed Flying-fox such that a viable local population of the species would be placed at the risk of extinction.

Rosenberg's Goanna (Heath Monitor)

The study area provides relatively low quality habitat for Rosenberg's Goanna, given the previous disturbances, lack of sheltering resources and obvious foraging opportunities. Very few terrestrial termite mounds (termitaria), which provide potential breeding resources, were observed in the study area, and were generally located in the north beyond the subject site.

The species is not known from the Mundamia urban land release area, although it has been recorded in the vicinity to the south west. Targeted trapping, remote camera and opportunistic surveys in the Mundamia area by BES (2004a) and ELA have failed to record the species, but regularly recorded the Lace Monitor, on several occasions within the current study area.

While Rosenberg's Goanna could conceivably occur in the study area, it is unlikely to do so on a regular basis given the lower habitat quality and lack of sightings in surrounding areas. The study area does not provide an obvious corridor or habitat linkage and few, if any, termitaria would be removed by the proposal. The species has some potential to be indirectly affected by the proposal, for example by an increase in vehicle numbers that could lead to an increase in road kills. However, surveys results, records of the species in the locality, the poor quality of habitat in the study area and the distribution of better quality habitat in surrounding areas suggests that road kills and other indirect impacts are unlikely to substantially affect the species.

The proposal is unlikely to have an adverse effect on the life cycle of this species, such that a viable local population would be placed at the risk of extinction.

7.5.3 Mitigation Measures

To further ameliorate the potential impacts of the proposal and ensure the best possible environmental outcomes, the following recommendations for impact mitigation and amelioration should be required as to the proposal and/or imposed as conditions of consent.

1. The potential for the proposal to adversely affect hydrological regimes and water quality for adjacent habitats of conservation significance should be controlled by the implementation of recharge areas to replicate water flows to adjoining areas (i.e. Martens 2012) along with strategies to maintain water quality.
2. The proposal also has the potential to indirectly degrade surrounding habitats in other ways, such as trampling, dumping of rubbish and garden waste, weed invasion, off-road vehicle use, increased fire frequency and increased predation of native fauna by pet cats and dogs. Surrounding areas contain habitat for several species of conservation significance and increased protection of these areas is necessary. Strategies and actions should be detailed in a management plan for the surrounding areas, in consultation with relevant landowners and government departments. The management plan should address issues including access to surrounding habitats, fire management, weed control, drainage and erosion control, long-term monitoring and public education.
3. Consideration should be given to more formal protection of nearby land containing species and habitats of conservation significance, such as conservation agreements, protective land zoning and/or transfer to the DECCW reserve system.
4. A worker induction program should be implemented to prevent damage to adjoining habitats to be retained.
5. Sediment and erosion controls should be employed prior to any work commencing on the land and maintained on a regular basis for as long as necessary.

6. If possible, cone-bearing Black She-oak trees should be retained and/or planted for landscaping as foraging resources for the threatened Glossy Black-cockatoo.
7. Invasive plant species should not be used for landscaping purposes.
8. Pre-clearing surveys should be employed prior to the removal of hollow-bearing trees.
9. Protocols for removing hollow-bearing trees should include tree felling at least one day after clearing of other vegetation and lowering of hollow sections to the ground to allow inspection by ecologist or wildlife handler.
10. A land purchaser's kit should be produced, which contains simple and clear guidelines for land owners on environmental responsibilities and actions to avoid impacts on surrounding habitats.

Conclusion

The proposal is located primarily in an area of severe historic disturbances, which greatly limits the value of the subject site for threatened flora and fauna species. The direct impacts of the proposal on threatened species are minimal. No endangered populations or ecological communities occur in our or near the study area. However, beyond the subject site are species and habitats of considerable conservation value, primarily for the threatened plants *Triplarina nowraensis* and *Pterostylis vernalis,* which are susceptible to indirect impacts from the proposal. These indirect impacts need to be addressed and controlled, with additional protection given to nearby areas containing the species or suitable habitat for the species. Provided that measures to mitigate and manage the indirect impacts the proposal are applied it is unlikely that the proposal will result in significant impacts to any threatened species. On the basis of the above Eco Logical Pty Ltd therefore concluded that a Species Impact Statement would not be required for the proposal.

7.6 Bushfire Risk

7.6.1 Existing Environment

SET Consultants has undertaken a Bushfire Risk Assessment and the results and recommendations of the report (Appendix 3) are provided in the following section.

The wider Mundamia urban release area contains four native vegetation communities: 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. 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.

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. 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.

7.6.2 Potential Impacts

Bushfire risk is defined by the PBP guidelines as "*the chance of a bushfire igniting, spreading, and causing damage to assets of value to the community. Risk may be rated as being extreme, major, moderate, minor or insignificant and is related to the vulnerability of the asset*".

The bushfire risk associated with the proposed subdivision ranges from low to high depending on the lot in question. The reason for the variability in bushfire risk is that the proposed residential lots will be constructed in stages and are surrounded by a mixture of:

- Proposed and existing residential development, and
- Un-developed land, which is vegetated and will remain, vegetated into the foreseeable future.

Table 7.2 provides a breakdown of the vegetation type, slope class and the required APZ for the proposed stages. 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.

Table 7.2**:** 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 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

Direction	*Dominate Vegetation Type*	*Effective Bushfire Slope*	*Required APZ (m)*	*APZ Provided (m)*	*Comments*
					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 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 will be residential development and sealed roads.

Direction	*Dominate Vegetation Type*	*Effective Bushfire Slope*	*Required APZ (m)*	*APZ Provided (m)*	*Comments*
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.
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	9m wide APZ easement will be

Direction	*Dominate Vegetation Type*	*Effective Bushfire Slope*	*Required APZ (m)*	*APZ Provided (m)*	*Comments*
				25	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.
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	Upslope	100	100	The site will be developed as part of

Direction	*Dominate Vegetation Type*	*Effective Bushfire Slope*	*Required APZ (m)*	*APZ Provided (m)*	*Comments*
	vegetation				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 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	Forest	1 ° downslope	25	Minimum	45m of road reserve (Jonsson Rd

Direction	*Dominate Vegetation Type*	*Effective Bushfire Slope*	*Required APZ (m)*	*APZ Provided (m)*	*Comments*
(Northwest)				45	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.

7.6.3 Mitigation Measures

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.

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 7.3 and Attachment 8. 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.

Table 7.3: 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).

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.

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.

If the proposed 109 lot subdivision of Lot 1 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.

7.7 Acid Sulfate Soils

7.7.1 Existing Environment

Coastal, low-lying alluvial soils generally below RL 5 (**and occasionally at higher elevations**) can contain pyrite or other sulphides. In situations where the sulphides remain out of contact with air they are relatively stable and generally in 'equilibrium' with the surrounding environment. Soils that have appreciable pyrite or other sulphides that have not yet reacted significantly with air are referred to as Potential Acid Sulphate Soils (PASS). Pyritic soils that have already started generating acid are referred to as Actual Acid Sulphate Soils (AASS).

According to the Shoalhaven City Council State of the Environment (SCC SOE) online Acid Sulphate Map the site is classified as 'No known occurrence' of ASS.

As part of the Geotechnical Assessment prepared by Martens and Associates (Appendix 9) fifteen soil samples were screened using field and oxidised pH. Initial pH results indicated a potential for ASS on site and additional laboratory analysis was undertaken. sPOCUS analysis was undertaken on all fifteen samples and results are presented in Table 7.4.

Table 7.4: sPOCUS analysis

Sample ID	Testing Location	Sample Depth (m)	Soil Type	pH_{KCl}[1]	pH_{OX}[2]	TPA (mol H+/t)[3]	TSA (mol H+/t)[4]	S_{POS} (%S oxidisable)[5]
2863/103/0.4	**103**	**0.4**	**Fill - clay**	**4.3**	**3.6**	**32**	**<5**	**0.03**
2863/105/0.2	**105**	**0.2**	**Fill- clayey silt**	**4.2**	**3.7**	**140**	**87**	**0.06**
2863/105/0.6	**105**	**0.6**	**Clayey sand**	**3.9**	**3.6**	**55**	**<5**	**0.006**
2863/SS114	114	0.05	Silty Sand	6.7	3.6	<5	<5	0.04
2863/115/0.05	115	0.05	Sandy clay	4.3	3.3	32	7	0.03
2863/117/0.05	**117**	**0.05**	**Silty sand**	**4.3**	**2.7**	**180**	**140**	**0.02**
2863/117/0.3	117	0.3	Clayey sand	4.5	3.8	12	<5	0.01
2863/117/1.0	**117**	**1.0**	**Sandy clay**	**4.2**	**3.9**	**47**	**<5**	**0.04**
2863/123/0.1	123	0.1	Sand	4.3	4.0	12	<5	<0.005
2863/125/0.05	**125**	**0.05**	**Silty sand**	**4.4**	**3.0**	**100**	**65**	**0.01**
2863/128/0.05	128	0.05	Silty sand	4.6	3.7	7	<5	0.006
2863/129/0.05	**129**	**0.05**	**Silty sand**	**3.8**	**2.5**	**260**	**220**	**0.009**
2863/129/0.2	129	0.2	Silty sand	4.8	3.6	<5	<5	0.007
2863/133/0.05	**133**	**0.05**	**Gravely sand**	**4.1**	**2.5**	**300**	**260**	**0.03**
2863/134/0.2	**134**	**0.2**	**Gravely sand**	**3.8**	**3.0**	**120**	**87**	**0.007**
Guideline Limit (Action Criteria)			**Course Texture**	-	-	**18**	**18**	**0.03**
			Medium Texture	-	-	**36**	**18**	**0.06**

Notes:
[1] Actual pH;
[2] Post peroxide oxidation pH;
[3] Total Potential Acidity;
[4] Total Sulfidic Acidity;
[5] Percentage oxidisable sulfur.

Laboratory results indicate that levels are above the Acid Sulfate Soils Management Advisory Committee (ASSMAC) guidelines (bolded in Table 7.X). Location of samples above the ASSMAC guidelines are distributed widely across the site in both natural and fill horizons with no identified pattern of distribution.

Martens concluded that given the sites location and residual soil landscape on rock, the origin of soil potential acidity is likely the underlying geology.

7.7.2 Potential Impacts

If Acid Sulphate Soils are disturbed by excavation, thereby allowing ready access of oxygen to the sulphides, a natural oxidation reaction takes place and results in the generation of sulphuric acid or acid sulphates. The acid is then transported by water and, if allowed to build up in sufficient concentration, poses a direct environmental threat to organisms that come in contact with such waters. In addition, increasingly acidic waters can dissolve many metal ions that would otherwise remain insoluble and not available for uptake by organisms. Such ions include aluminium, iron and a suite of heavy metals such as zinc, lead and cadmium, which at elevated levels can be toxic to plants, animals and humans. The principal activity likely to expose the underlying AASS and PASS to oxidising conditions is the excavation of soil.

7.7.3 Mitigation Measures

An Acid Sulphate Soils Management Plan will be prepared as part of the documentation to support a construction certificate application for Stage 1 construction. The ASS management plan will provide a framework for achieving environmental objectives in order to minimise the risk of harm to human health and the environment during and following the proposed development. The ASS management plan will outline the procedure for neutralisation the disturbed soil in order to minimise the potential for adverse environmental impact.

Records of monitoring and neutralisation activities (soil and leachate) will be maintained by a suitably qualified consultant. A final report will be issued upon completion of the works discussing the monitoring regime, the results obtained and hence confirm that adequate neutralisation treatment.

7.8 Traffic and Access

7.8.1 Existing Environment

SET Consultants engaged Bitzios Consulting Pty Ltd to undertake a Traffic Impact Assessment and the results and recommendations of the report (Appendix 4) are provided in the following section. The road network in the vicinity of the site includes the Princess Highway, Kalandar Street, Albatross Road, Yalwal Road, George Evans Road, Jonsson Road and Stonegarth Road.

- The Princess Highway is the main road in the vicinity of the subject site. The Princes Highway is the only continuous north-south route through the Shoalhaven Region. It links Shoalhaven to Sydney to the north and Batemans Bay and Canberra to the South. The Princes Highway in the vicinity of the turnoff to Mundamia (Kalandar Street) comprises three southbound lanes and two northbound traffic lanes with a 70 kilometre per hour speed limit. Access from the Princes Highway onto Kalandar is controlled through traffic lights.
- Kalandar Street runs west from the Princes Highway and onto Albatross Road in a south west direction which provides access to West Nowra, South Nowra, Mundamia and Nowra Hill. Albatross Road comprises two lanes of traffic, one lane in each direction with sealed shoulders and a speed limit of 60 kilometres per hour.
- Yalwal Drive runs west from Albatross Road into the West Nowra, Mundamia, Longreach and Bamarang. The intersection of Albatross Road with Yalwal Road is a t-intersection controlled by give way signs, with Albatross Road having priority. Yalwal Road comprises two lanes of traffic, one lane in each direction with sealed and unsealed shoulders and a speed limit of 60 kilometres per hour.
- Yalwal Road and George Evans Road form a t-intersection. George Evans Road provides access to Mundamia, the Shoalhaven University Campus and the subject site. George Evans Road comprises of two lanes of traffic, one lane in each direction and a speed limit of 50 kilometres per hour.

Table 7.5 below outlines the number of current traffic movements at the main intersections in close proximity to the subject site. These have been taken at peak hours of the day and evening.

Table 7.5: Current Traffic Movements at Intersections

Intersection	Traffic movements (AM Peak 1 hour)	Traffic movements (PM Peak 1 hour)
UOW and George Evans Rd	141	93
Yalwal Rd and George Evans Rd	317	300
Yalwal Rd and Albatross Rd	1150	1485
Albatross Rd and Berry St	1240	1548
Albatross Rd and Kalandar St	1768	1798
Total movements	**4616**	**5224**

7.8.2 Potential Impacts

The proposed subdivision involves the creation of six new roads off George Evans Road including the new spine road (unformed crown road) running along the eastern boundary of the site and the other five being the internal. Although these new roads will need to be adequate for residents and visitors of the new subdivision, the existing main roads within close proximity to the site experience a heavy increase in movements. In order to measure traffic conditions, counts were undertaken at the two main roads leading to the subject site (Yalwal Road and Albatross Road) and the results are shown below in Table 7.6. The 'red' text highlights the scenario where the link volume exceeds the capacity threshold.

Table 7.6: A breakdown of the total number of vehicles using Yalwal Road and Albatross Road

Scenario	Direction	AM		PM	
		Yawal Rd	Albatross Rd	Yawal Rd	Albatross Rd
2012	To Nowra	88	501	144	798
	From Nowra	198	499	126	485
2012 with Development	To Nowra	415	799	357	1024
	From Nowra	383	671	416	748
2022	To Nowra	115	661	190	1053
	From Nowra	267	658	167	640
2022 with Development	To Nowra	436	918	391	1213
	From Nowra	431	789	446	863

The outputs from Table 7.10 suggest that Yalwal Road should mostly operate satisfactory without dedicated turn lanes. The only intersection is likely to require dedicated turn lanes in the intersection of Depot Road. The outputs from the table also suggest that Albatross Road between Yalwal Road and Berry Street will require a plan of management as the left turn movements 'in' and right turn movements 'out' of the side street are expected to be high.

The capacity issues for the side streets along Albatross Road are existing issues and will be exacerbated by future traffic growth regardless of the Mundamia development. Consideration may be given to installing a roundabout at the Yalwal Road intersection with a centre median for the entire section length. Alternatively, installing signalized intersections at Yalwal Road and/or Berry Street may provide suitable gaps in traffic to safely turn onto Albatross Road. The provision of left turn lanes into the side streets is likely to be required unless the plan of management proposes to restrict all access from Albatross Road.

The impact of the traffic associated with the proposed development has been assessed with regard to the RTA Guide to Traffic Generating Developments. This is the standard document used to assess the impact of traffic associated with developments. The typical generation rates for residential dwelling houses and medium density residential flat buildings are provided in Tables 7.7 and 7.8. Note that a trip is defined as one-way vehicle movement from one point to another. Therefore, a return trip to and from a land use is counted as two trips.

Table 7.7: Typical generation rates for residential dwelling houses (RTA Guide)

Dwellings houses	Daily vehicle trips	9.0 per dwelling
	Weekday peak hour vehicle trips	0.85 per dwelling

Table 7.8: Typical generation rates for medium density residential flat buildings (RTA Guide)

Units / flats (up to two bedrooms)	Daily vehicle trips	4 - 5 per dwelling
	Weekday peak hour vehicle trips	0.4 - 0.5 per dwelling
Units / flats (three bedrooms or more)	Daily vehicle trips	5 - 6.5 per dwelling
	Weekday peak hour vehicle trips	0.5 - 0.65 per dwelling

Using the above rates, the future increase in traffic volumes associated with the proposed subdivision and the creation of an additional 105 residential lots are summarised in Table 7.9. The calculation of the traffic volumes for medium density housing has been taken ranging from small (up to two bedrooms) to large (three bedrooms or more). As can be seen from Table 7.9, the future increase in traffic flow associated with the proposed subdivision is relatively low.

Table 7.9: Future traffic flows due to the proposed subdivision

Dwelling Yield	Daily vehicle trips	Weekday peak hour vehicle trips
104	927	87.5
Medium Density Dwelling Yield	Daily vehicle trips	Weekday peak hour vehicle trips
69	276 – 448.5	27.6 – 44.8

The proposed subdivision does also include a commercial component. However the use of this lot has not yet been determined and therefore an appropriate forecast of traffic volumes in relation to the RTA Guide to Traffic Generating Developments cannot yet be calculated.

Table 7.10 below outlines the predicted number of traffic movements (after the Mundamia development) at the main intersections in close proximity to the subject site. These have been predicted for peak hours of the day and evening.

Table 7.10: Predicted Traffic Movements at Intersections

Intersection	Traffic movements (AM Peak 1 hour)	Traffic movements (PM Peak 1 hour)
UOW and George Evans Rd	708	654
Yalwal Rd and George Evans Rd	826	805
Yalwal Rd and Albatross Rd	1634	1965
Albatross Rd and Berry St	1628	1932
Albatross Rd and Kalandar St	1923	1951
Total movements	**6719**	**7307**

The predicted traffic movements in Table 7.10 are significantly greater than the existing movements as shown in Table 7.5 as a result of the subdivision. These movements have increased by over 2000 for both the morning and evening peak hours.

7.8.3 Mitigation Measures

The new proposed internal roads as well as the extension and upgrades of George Evans Road, Jonsson Road and the Spine Road (unformed Crown Road) will be designed and constructed to match the carriageway of the existing roads in accordance with the principles of a local road as defined in Council's DCP.

Table 7.15 shows the significant increase predicted in traffic movements at the five busiest intersections within close proximity to the subject site. As a result, upgrades have been recommended in the Traffic Impact Assessment for some of these intersections.

UOW Access / George Evans Road: No intersection upgrade required at this intersection.

Yalwal Road / George Evans Road: It is recommended that the configuration of the intersections be modified from AUR configurations to a CHR (Short Lane) configuration. The main reason for the preference of a CHR (Short Lane) is that turning traffic moves out of the through lane. Research conducted suggests that this configuration is 30 times safer than an AUR treatment. The works to convert the configuration is expected to be minimal and will be subject to the pavement condition of the outer lane with some possible minor widening works to the roadside shoulders.

Albatross Road / Yalwal Road: A roundabout is considered to be the preferred treatment as it will safely allow for u-turn manoeuvers should turn restriction be implemented mi-block along Albatross Road. In, addition, the roundabout will cause less driver frustrations outside of the peak period with motorists having to wait unnecessarily outside the peak periods under a signalized intersection arrangement.

Albatross Road / Berry Street: Only minor additions to the existing roundabout are required to ensure the intersection operates under capacity with full development by 2022. Traffic signals options were tested, however a substantial intersection footprint would be required to maintain a suitable level of operation during the peak periods. As the minor modifications to the existing roundabout addressed the traffic capacity issues, it has been recommended as the preferred treatment. The management of pedestrians using the main shared path along Albatross Road may need further signposting/delineation/lighting measures for safety purposes, particularly in the vicinity of the road crossing areas near intersections.

Albatross Road / Kalandar Street / Kinghorne Street: The proposed configurations and signal phasing details for the intersections are shown in Section 3.5.5 of the Traffic Impact Assessment (Appendix 4).

Alternative Option: Given the likely costs to upgrade the above mentioned intersections, in the longer term Council may see it more beneficial to consider implementing a series of 'bypass routes'. One possible low cost option to deviate traffic into the Nowra town centre area via Bice Road is shown below it Figure 7.2.

Figure 7.1: Possible bypass route as an alternative option to intersection upgrades

Having considered the subject site and its location within Mundamia, it is considered that the majority of the traffic flow along the proposed new roads will be generated by the proposed subdivision. Out of the proposed new roads George Evans Road and the Spine Road will be the most likely roads to experience additional traffic movements in the future as it will create the link to public facilities and to the town centre and university.

The estimated additional traffic generated as a result of the proposal is between 2103 and 2083 vehicle movements per day (during peak holiday period when the occupation rate is 100%), which is well within the capacity of the existing road network as demonstrated in this report. Therefore, it is unlikely that the proposed development will have a detrimental effect on the local traffic and driver safety within the area and surrounding road network.

7.9 Visual Assessment

7.9.1 Existing Environment

The overall site, consisting of Lot 1 DP 1021332 and Part Lot 458 DP 1063107, comprises an irregular shaped area of some 12.3ha with maximum north-south and east-west dimensions of 600m and 330m respectively. 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.

The subject 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. An electrical easement runs through the southern section on the site in a north west to south east direction.

The site lies at an altitude of approximately 60 - 70 m Australian Height Datum (AHD) and forms part of sandstone plateaux. The site is generally level to very gentle sloping land, however, there are some steeper down slopes (approximately 3º - 5º) located around the edge of the area previously affected by the quarrying operation. This was not a commercial quarrying operation. IT was more like a borrow pit where Council obtain construction materials. The land overall generally slopes in a north westerly direction.

7.9.2 Potential Impacts

Below are the potential visual amenity impacts of a poorly designed subdivision and associated infrastructure and dwellings:

- Clearing of vegetation on the developed site;
- Poor compatibility of future dwellings with the local;
- Increase area of bitumen and paved areas at prolongation of existing streets;
- Erection of houses and activities increase the visual footprint of the townscape by day and night;
- Overshadowing;
- Loss of privacy; and
- Loss of solar access

7.9.3 Mitigation Measures

In order to ascertain the visual sensitivity of the area, a visual assessment was undertaken that included identifying the important vantage points and view corridors. Vantage points or viewpoints are specific locations from which the landscape character is assessed. The process leading to the identification of important viewing areas was derived from research into the visual sensitivity of the subject site and understanding the site in broader local topography.

Following site visits and a site analysis assessment eleven (11) important viewpoints where identified, representing all character precincts with distant, middle and local views. The viewpoints identified have distant, middle or immediate views, which are defined as follows:

- Distant views are regional views beyond the radius of 3km from a viewpoint.
- Middle views are within a radius of 2 km from the viewpoint.
- Immediate views are local views within a radius of 500m from the viewpoint

A Visual Impact Assessment Plan showing the location (Figure 7.2) and view from the viewpoints are provided in Attachment 11. Photos of the site are provided in Attachment 2. Note: The location of Site 11 Cambewarra Lookout is not shown on the plan due to the distance to the subject site located. The identified viewpoints are discussed below.

Figure 7.2: Location of identified view points

Site 1 Jonsson Rd (RL – 65m AHD)

View 1 is located 100m east of the subject site at the entrance to an existing residence off Jonsson Road. The view is taken in a south westerly direction from the Jonsson Road. The view from this location will be affected as there is no buffer vegetation located between the view point and the subject site. However, the land occupied by the existing dwelling and land between Jonsson Road and the subject site comprise part of the overall Mundima Urban Release Area and is proposed to be developed as part of MP08-0141 currently being assessed by the Department of Planning and Infrastructure. Therefore the potential visual impact associated with this viewpoint is considered low.

Site 2 – Existing Dwellings on Jonsson Road (RL – 64m AHD).

View 2 is located 370m northeast of the subject site at the entrance to an existing residence off Jonsson Road. The view is taken in a south-westerly direction from Jonsson Road. The existing forest vegetation (height of trees 12m -15m) between the dwellings and the proposed subdivision will not be removed as part of this development.
Therefore the proposed development will not be visible from this viewpoint and thus the visual amenity of the dwellings will not be affected. The potential visual impact associated with this viewpoint is considered very low.

Site 3 Lookout at the end of Jonnson Road (RL – 45m AHD)

View 3 is located 1.4km northeast of the subject site at the lookout located at the end of Jonnson Road. The view is taken in a south-westerly direction from Jonsson Road. The existing forest vegetation (height of trees 12m -15m) between the lookout and the proposed subdivision will not be removed as part of this development. Therefore the proposed development will not be visible from this viewpoint and thus the visual amenity of the dwellings will not be affected. The potential visual impact associated with this viewpoint is considered very low.

Site 4 – University of Wollongong Shoalhaven Campus (RL – 72m AHD)

View 4 is located 500m southwest of the subject site at the University of Wollongong Shoalhaven Campus located of George Evans Road. The view is taken in a north to northeastlery direction from the University carpark. The existing forest vegetation (height of trees 12m -15m) between the University and the proposed subdivision will not be removed as part of this development. The proposed subdivision maybe visible through the remaining vegetation, however, these would be filter views of a minor in nature. The potential visual impact associated with this viewpoint is considered low to medium low.

Site 5 - Yalwal Road west of George Evans Road (RL 61m AHD)

View 5 is located at Yalwal Road west of the entrance to George Evans Road 1.2km southwest of the subject site. The view is taken in a northeastlery direction from the southern side of Yalwal Road. The existing forest vegetation (height of trees 12m -15m) between the Yalwal Road and the proposed subdivision will not be removed as part of this development. The UOW campus is located 500m from Yalwal Road generally in the same direction of the proposed development is not visible from this viewpoint. The proposed development will not be visible from this viewpoint, thus visual amenity of the public will not be affected. The potential visual impact associated with this viewpoint is considered very low.

Site 6 - Yalwal Rd east of George Evans Road (RL 47m AHD)

View 6 is located at Yalwal Road east of the entrance to George Evans Road 1.3km southeast of the subject site. The view is taken in a north westerly direction from the northern Yalwal Road across Flat Rock Creek dam. The existing forest vegetation (height of trees 12m -15m) between the road and the proposed subdivision will not be removed as part of this development. Therefore the proposed development will not be visible from this viewpoint and thus visual amenity of the public will not be affected. The potential visual impact associated with this viewpoint is considered very low.

Site 7 - Filter Street (RL - 63m AHD)

View 7 is located 1.3km east of the subject site at Filter Street. The view is taken in a westerly direction from the eastern side of Filter Street. The existing forest vegetation (height of trees 12m -15m) between the road and the proposed subdivision will not be removed as part of this development. Therefore the proposed development will not be visible from this viewpoint and visual amenity of the dwellings will not be affected. The potential visual impact associated with this viewpoint is considered very low.

Site 8 - Ben Walks lookout showground (RL - 39m AHD)

View 7 is located 2km northeast of the subject site at Bens Walk lookout within the Nowra Showground. The view is taken in a south westerly direction along the Shoalhaven River. The existing forest vegetation (height of trees 12m -15m) between the lookout and the proposed subdivision will not be removed as part of this development. Therefore the proposed development will not be visible from this viewpoint and thus the visual amenity of the public will not be affected. The potential visual impact associated with this viewpoint is considered very low.

Site 9 - Ski Park (RL 5m AHD)

View 9 is located 800m north of the subject site at Shoalhaven Ski Park. The view is taken in a southerly direction across the Shoalhaven River. The existing forest vegetation (height of trees 12m -15m) between the Ski Park and the proposed subdivision will not be removed as part of this development. Therefore the proposed development will not be visible from this viewpoint and thus the visual amenity of the occupants of the ski park will not be affected. The potential visual impact associated with this viewpoint is considered very low.

Site 10 - Yurunga Drive lookout (RL – 50m AHD)

View 10 is located 2km northeast of the subject site at the existing lookout at Yurunga Drive (The Grotto Walk). The view is taken in a south westerly direction across the Shoalhaven River. The existing forest vegetation (height of trees 12m -15m) between the lookout and the proposed subdivision will not be removed as part of this development. Therefore the proposed development will not be visible from this viewpoint and thus the visual amenity of the public will not be affected. The potential visual impact associated with this viewpoint is considered very low.

Site 11 - Cambewarra lookout (RL – 670m AHD)

View 11 is located 11.5km to the north east of the site at the existing lookout on Cambewarra Mountain. The view is taken in a south westerly direction across the Nowra Bomaderry Region. The roof of the University Campus and the cleared pastureland adjacent to the subject site are visible from this viewpoint but do not dominate the landscape. The proposed development of the subject will result in the removal of vegetation and the construction of the roads and new dwellings. The development will be visible from the lookout but will not be out of charter with the existing view of an urban area and will not dominate the landscape. The visual amenity of the public from the lookout will not be significantly affected. The potential visual impact associated with this viewpoint is considered low to medium low.

Conclusion

The proposed development will not be visible from outside the larger Urban Release Area, except from the University as it expands in the future and from distant view points at high elevations such as Cambewarra Mountain. The proposed development's potential for visual impact on locations outside the development is considered to be very low.

The following measures are proposed to assist with minimizing the any potential visual impacts:

- Introduction of street tree planting in species compatible with the native vegetation of the area.
- Use of sympathetic building materials. Limit the colour of roofs to non-reflective colour blending with the natural environment.
- Building heights in keeping with existing housing in the visual catchment.

The visual amenity of residents in the proposed subdivision has been addressed in the following manner:

- The proposed street layout reinforces the existing settlement character of the locality and enhances the ecological urban form and visual characteristics. This street pattern provides views to the important natural features of the site and local environs. It also limits fast moving traffic and facilitates way-finding and legibility. Water sensitive urban design principles have been adopted for the management of stormwater runoff.

- All allotments will facilitate dwelling orientation that enables energy efficient design. Cooling summer breezes from the east and north-east are available to all proposed allotments, while the colder winter winds from the west and south-west are relatively protected. Dwellings constructed on larger allotments with wider frontages to the edge road will allow filtered views from the houses erected to the west via larger side boundary setbacks and driveways. There will be not overshadowing on any of the developed lots.

- The neighbourhood will afford views and vistas to Cambewarra Range and adjoining bushland. The bushland will provide a valuable natural setting for the neighbourhood and determine the local landscape character. An entry point into the neighbourhood will communicate a sense of arrival and contribute to neighbourhood identity.

7.10 Landscaping

7.10.1 Existing Environment

As Mundamia is predominantly covered native vegetation with limited development and services, the area has no formal landscaping or specific street tree species within the road reserves. Native vegetation, is present in the undeveloped privately owned land holdings. The landscaping within the existing street network leading up to the university and subject site has been undertaken by Council and consists of predominately native vegetation to tie in with the rural setting.

7.10.2 Potential Impacts

Below are the potential environmental impacts of poorly designed landscaping:

- Poor visual appearance;
- Spread of weeds; and
- Increase soil erosion.

7.10.3 Mitigation Measures

Landscaping will be undertaken in accordance with the Landscape Masterplan 5221_01 (April 2013) prepared by Shoalhaven City Council and provided in Attachment 12. Detail landscape plans will be provided for each stage at the construction certificate stage for the development.

Figure 7.3: Concept Landscape Plan

LANDSCAPE PHILOSOPHY

Integrate the principles of a sense of place, sense of community, enriched biodiversity and well resolved water sensitive urban design. The primary aim underpinning the landscape design throughout the Mundamia Subdivision is to achieve a quality landscape resolution, which acts as a fabric uniting streetscapes with public open space and the village centre. The intention is to achieve continuity and containment providing a high quality setting for the housing development. The road network surrounding and within the subdivision is unified with street trees, which when mature, will be the most prominent landscape element. They are intended to help define boundaries, reduce traffic speeds, provide shade and habitat for fauna, and be integrated with stormwater management systems. Mundamia Subdivsion will be formed by green streets, which contribute to creating an enjoyable sense of place.

Principles which underpin the landscape Masterplan

- Maximise landscaping in all streets. Native trees have been included in all streets.
- The landscape masterplan (including species selection and open space design) has been undertaken to reflect the surrounding natural area and local context.

- The planting and material palette pick up on the existing native bushland and geology in the land immediately surrounding and bordering the proposed development.
- Included in the avenue streetscape planting are larger scale native (evergreen) trees with canopies which will touch when mature.
- Included in the local streetscape is tree planting in scale with the road reserve allowing for a mix of pathways, bioswales and grassed verges whilst maintaining clear sight lines.
- Potential conflicts with other street elements, such as street lights, bollards, bioswales and car doors being opened onto tree trunks have been considered in the selection and placement of planting.
- Where appropriate the landscape plan integrates with water sensitive urban design systems.
- Provide pedestrian and vehicular connectivity to proposed adjoining subdivision and neighbouring University Campus.
- Minimize impact on surrounding vegetation, specifically the Spring Tiny Orchid and the Nowra Heath Myrtle located outside of the subject site.
- Promote biodiversity through careful plant selection throughout the subdivision and integration of landscaped bioswales and water sensitive urban design.
- Provide opportunity for passive recreation in the open space heart of the subdivision which will promote and encourage social interaction and connectivity.
- Provide a safe environment in a landscaped setting.
- Encourage community art that represents the character of the area by engaging local and indigenous artists.
- Provide landscaped entrances and roundabouts to the development with native grass planting and sculpture utilising the natural elements of the area.

VEGETATION

The planting palette for Mundamia Subdivision streetscape and public open space is drawn from the existing remnant native vegetation in the surrounding area. The paperbark, stringybark and scribbly gum woodlands dominate over a forest floor scattered with dry heath land and grasses. The gnarly dry forest provides the backdrop for the selection of a predominantly native plant palette for the open spaces throughout the subdivision.

STREET TREES:

GEORGE EVANS ROAD - Tree Species #5

- *Eucalyplus punctala,* Grey Gum

JONSSON ROAD - Tree Species #6

- *G/ochidion femandi'* Cheese Tree'
-

UNFORMED ROAD - Tree Species #2

- *Eucalyplus maculala,* Spotted Gum

LOCAL STREET BORDERING PUBLIC OPEN SPACE:

ROAD 2 & 3 - Tree Species #1

- *Melia azerdarach 'Caroline',* White Cedar cultivar

LOCAL STREETS IN RESIDENTIAL AREA:

ROAD 4 & 5 - Tree Species #4

- *Trislania laurina 'Luscious',* Brushbox cultivar

ROAD 1 & 6 - Tree Species #3

- *Cupaniopsis anacardiodes* , Tuckeroo

LOCAL PARKS & SUBDIVISION ENTRYWAY:

TREES:

- *Eucalyplus scoparia,* Wallangarra White Gum
- *Corymbia cilridora 'Lemon Squash',* Lemon Scented Gum cultivar
- *Eleocarpus reliculalus,* Blueberry Ash
- *G/ochidion femandi'* Cheese Tree'
- *Melaleuca decora*

SHRUBS:

- *Angophora hispida - Dwarf Apple*
- *Banksia robur - Swamp Banksia (use near waler/boggy spols) 1-2m high* x *5-7m wide)*
- *Doryanlhes excelsa - Gymea Lilly*
- *Crinum flaccidum - Darling Lilly*
- *Banksia 'Giani Candles'*
- *'Grey* BoxTM *Weslringia frulicos* a
- *Agonis flexuosa 'Weeping wonder' (900mm* x *2m)*
- *'Double Gold' TM Gazani* a

GRASSES:

- *Nafray - Penniselum alopecuroides PA300*
- *Purple Lea - Penniselum alopecuriodes PA400*
- *Kingsdale - Poa poaformis PP500*
- *Eskdale - Poa labilardilleri*
- *Shara TM Lomandra fluviallilis*
- *Tanika TM - Lomandra LONGIFOLIA*
- *Wingarra TM- Lomandra cenlerfolia*

CLIMBERS:

- *Pando rea pandorana 'Lady Dr*
- *Clemalis arislala - Old Man's Beard*

BIOSWALE PLANTS:

- *Carex appressa*
- *Isolepsis nodosa*
- *Juncus usilalus*
- *Causlis flexuosa*

STREETSCAPE

The design principles for the road reserve are to assist in creating streets that are calm, easy to navigate and enjoyable to use. The streetscape design is paramount in encouraging connectivity throughout the subdivision by creating a pleasant environment and a meaningful sense of place in context with the Mundamia surrounds.

PRINCIPLES WHICH UNDERPIN THE STREETSCAPE LAYOUT

- Provide a sufficiently wide carriageway to allow vehicles to pass safely.
- The design of street lighting and landscaping is integrated to avoid conflicts and the treatment of street trees and verges are consistent throughout the subdivision.
- Pedestrian footpaths have been included (unless the street is a share-way for vehicles, pedestrians and cyclists, or where vehicular traffic levels are very low).
- Driveway cross-overs of the verge are in similar materials and colour as the footpath to achieve visual continuity.
- Pathway network to integrate into carriageway providing safe way-finding to and through the subdivision.
- On quiet local streets with no dedicated footpath pedestrian movement will be via the road.
- Unify all streets with landscape. In maturity the trees will be the dominant feature of the streets.
- Provide a hierarchy of streets to reinforce the natural character of the area Incorporate water sensitive urban design into designated streetscapes and open public space.
- Houses located on corners will be encouraged to address both street frontages to add to the overall streetscape appeal. Low-medium hedging will be encouraged where privacy to the front yard is desired Provide continuity and consistency in the streetscape with linear elements such as trees, colour of pathway, garden and materials, ensuring it continues through the intersections.
- Use of appropriate furniture will ensure a sense of place and promote the open space as meeting place.
- Edgestrip and bollard to be used where appropriate to create delineation between carriageway and verge. It will also assist in preventing parking on verge and support water sensitive urban design (WSUD).
- Streets throughout this proposed subdivision have been designed to suit their purpose.

PUBLIC OPEN SPACE

A 8644m2 (lot 25) centrally located passive open space has been dedicated to act as a unifying green square. This community space is accessed by a pathway network designed to create safe and enjoyable way finding around the subdivision.

The open space area proposes the following elements;

- Rock lined water body to act as a detention/retention basin to filter stormwater runoff and harvest overland flow.
- Incorporate water sensitive urban design – Bioswale meandering through the passive open space connecting to the bioswales elsewhere on site.
- Pathways through open space to link into adjacent streetscape network to be natural in appearance, blend in with the landscape.
- Modern and sculptural play equipment for all ages.
- Open turf area for play, and relaxing.
- Public seating situated to encourage socialising.
- Shade trees and native bushland gardens incorporating local rock and plant species to attract and nurture local fauna.
- Encourage the visual and physical link through to the village centre, streetscapes and adjacent bushland.

- Landscaped vistas into, through and out of site will provide a greater connection to surrounds and will enhance the aesthetic appeal of the development.
- Access to the village centre and public open space will be by pathways and adjacent carparking.
- Landscaping of the road reserves fronting the village centre will further enhance the overall appeal of the subdivision.
- Provide a parkland escape for occupants of medium density and dual occupancy development throughout the subdivision.
- Materials and colour used in the public open space and planting to compliment the australian native bush theme.

MATERIALS AND COLOURS

The Mundamia Subdivision Masterplan colour and materials palette draws from the surrounding bushland and geology. From the sandstone bluffs and boulders, which line the Shoalhaven River not more than 500m away to the stony gravel creekbeds and heath land interspersed with Eucalypts and grasses which cover the site, the character is typically textural and craggy. Mundamia lends itself to a palette comprising rugged natural materials and earthy colours with the occasional contrasting complimentary splash of colour drawn from the sun setting in the west over Cambewarra Mountain or the delicate green stem of a native orchid.

The material palette is a response to the sandstone and ironstone found scattered over the site and nearby. The textures likewise also tend to mimic the stony finish of the forest floor, the papery bark of the Melaleucas, the dimples of the Spotted Gums. It is intended that the colours used for both public open spaces and streetscapes should be in harmony with the surrounding native bushland with an occasional vibrant cheeky splash of colour for contrast.

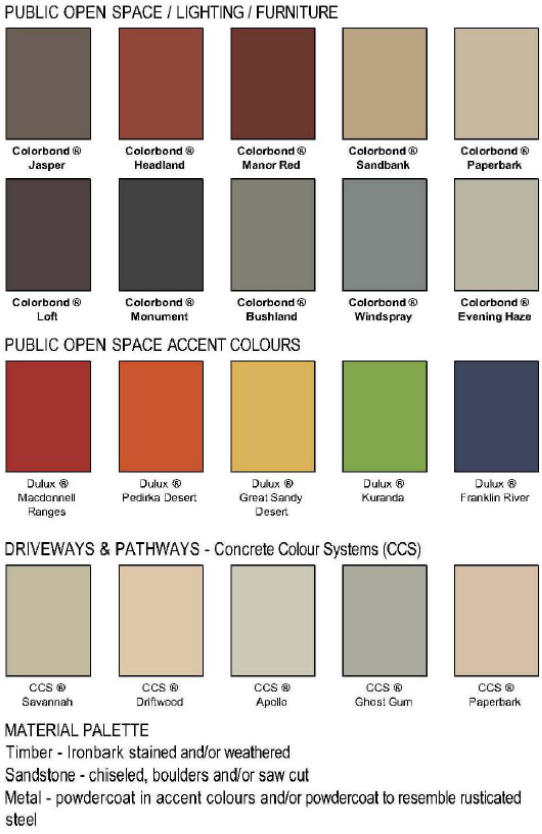

Figure 7.4: Colour & Material Palette

7.11 Social Environment

7.11.1 Existing Environment

The proposed subdivision will result in the creation of 105 residential allotments. In order to consider the likely impacts on social infrastructure, it is necessary to establish the likely population increase resulting from the proposed development. Shoalhaven City Council has established a web based Shoalhaven Community Profile providing access to population and housing information for the 2006, 2001, 1996 and 1991. The data comes from ABS (Australian Bureau of Statistics) census figures for 1996, 2001 and 2006 (place of enumeration, excluding overseas visitors).

This report places Mundamia in Area 1 Planning District, which covers the northern part of the Shoalhaven. Planning area 1 comprises a number of towns and villages in the northern section of the Shoalhaven Region including Berry, Shoalhaven Heads, Bomaderry, Nowra, North Nowra and South Nowra. Planning area 1 has a population of approximately 41,725.

Mundamia falls within the 'West Nowra – South Nowra' District of Planning Area 1. This district comprises of predominantly rural area, with some residential and industrial areas. Predominate industries include defence, manufacturing and education. The majority of the workforce commutes to Nowra/Bomaderry. West Nowra and Nowra Hill has a median age of 31 and 32 respectively and are between 4 and 11km from Nowra. The West Nowra – South Nowra District has a population of approximately 4,384 which is around 10.5% of the overall population for Planning Area 1.

The following statistics are provided in the Shoalhaven Community Profile for the West Nowra – South Nowra District. These areas are relevant to consider potential population expansion resulting from this subdivision:

- Average household size is 2.71 persons per household.
- The population is 4,384 comprising 57.2% male and 42.8% female.

According to the revised population projections adopted by Shoalhaven City Council, the population in planning area 1 is predicted to increase in line with Table 7.11.

Table 7.11: Population projections for planning area 1

Area / Year	2011	2016	2021	2026	2031	2036
Planning Area 1	41,725	44,999	48,193	51,720	55,337	59,118

The population age structure for the West Nowra – South Nowra District area is shown in Table 7.12. As can been seen in the table 23.2% of the population is aged between 35 and 49 years.

Table 7.12: Age structure the for South – West Nowra District area

Age group	Number	%
0 to 4 years	284	6.5
5 to 11 years	395	9.0
12 to 17 years	340	7.8
18 to 24 years	457	10.4
25 to 34 years	715	16.3
35 to 49 years	1,018	23.2
50 to 59 years	469	10.7

60 to 69 years	364	8.3
70 to 84 years	281	6.4
85 years and over	61	1.4
Total persons	**4,384**	**100.0**

7.11.2 Potential Impacts

This section outlines the population projections for the proposed subdivision based on the above profile. As outlined above, this proposal provides for a total of 104 residential allotments with a dwelling yield of 173. Given that the average household size is 2.71 persons per household, this figure has been used to calculate the population increase as a result of the subdivision.

In addition to an anticipated overall population growth of 387 persons Table 7.13 below shows the projected additional population, divided into the various age categories assuming current age distribution rates contained in Table 7.12 above.

Table 7.13: Age structure for the South – West Nowra area

Age group	Number	%
0 to 4 years	25.16	6.5
5 to 11 years	34.83	9.0
12 to 17 years	30.19	7.8
18 to 24 years	40.25	10.4
25 to 34 years	63.10	16.3
35 to 49 years	92.10	23.2
50 to 59 years	41.41	10.7
60 to 69 years	32.12	8.3
70 to 84 years	24.77	6.4
85 years and over	5.42	1.4
Total persons	**387**	**100.0**

Below are the potential social and environmental impacts of an increase in population associated with a proposed subdivision:

- Increased pressure on the local public health system;
- Increased pressure on freshwater supply;
- Increased pressure on the management and treatment of liquid and solid waste;
- A reduction in the biodiversity of the local area; and
- An increase in greenhouse gas emissions, largely from burning fossil fuels.

7.11.3 Mitigation Measures

While it is recognised that the Mundamia area currently has limited social infrastructure available, this proposal is for residential development on land which has been zoned for appropriately since the establishment of the Draft Local Environmental Plan 2009. It is considered that the proposed subdivision will only result in a minimal increase to the local population of the West Nowra – South Nowra district and as a result will have a negligible impact on the existing social infrastructure within the local region. Furthermore the proposal includes the establishment of a commercial centre with the capacity to handle the proposed increase in population.

7.12 Aviation

7.12.1 Existing Environment

HMAS ALBATROSS was commissioned on 31 August 1948 and has a Defence population of more than 1600 population in the Nowra district. It covers an area of approximately 520 hectares, with its primary role to support the Fleet Air Arm that provides aircraft air support to the fleet.

HMAS ALBATROSS provides military flying training and exercises in order to maintain the appropriate level of military capability required of the Australian Defence Force. This training is conducted in accordance with gazetted air space requirements. The local Military Restricted Airspace extends from Kiama in the north to Mollymook in the south and 15 nautical miles to the west of the Naval Air Station.

The subject site is located within the area identified as HMAS Albatroos Airfield Circuit Area (Military Airfield). Operating heights of surface to 2,000ft (610m) with a 5 nautical mile diameter. Flying operations include military aircraft and military approved civil aircraft for departures, arrival and circuit training. The airfield can be open 24 hours per day although normally operates from 8.00am to 5.00pm weekdays. Night flying is determined by the operational requirements of the squadrons based at Albatross. This is generally 1 to 2 nights per week, however, occasionally during periods of high fleet activity, this can increase to several consecutive nights and can occur at all hours.

These training areas have been established for many years.
The following aircraft types regularly operate from HMAS ALBATROSS

- S-70B-2 Seahawk helicopter
- SK50 Westland Soa King helicopter
- AS350 Squirrel helicopter
- Fixed wing aircraft similar to Learjet and the larger Hercules transport

Other aircraft types, including fast jet aircraft, operate from the airfield at less frequent intervals.

7.12.2 Potential Impacts

We acknowledged that it is essential that HMAS ALBATROSS is protected from off-airport development that could undermine its safety or operational efficiency. According to the International Civil Aviation Organization (ICAO), aircraft noise is the most significant cause of adverse community reaction to the operation and expansion of airports.

Exposure to aircraft noise can affect the quality of life of residents close to airports,
particularly in relation to sleep patterns. Expansion of airport runway facilities, increased airport use, change in flight patterns and additional residential development close to existing airports will increase the likelihood of adverse aircraft noise impacts being experienced by the community, unless aircraft noise is specifically taken into account in the planning process.

Reference to ANEF levels and the relevant Australian Standard can be used as a tool to assist in planning for new development proposed near airports. Australian Standard AS 2021—2000 provides guidance on the siting and construction of buildings impacted by aircraft noise and determining what measures might be used to reduce the impacts and provide acceptable indoor sound levels. Land with an ANEF level of less than 20 ANEF is generally regarded as being acceptable for new residential dwellings and other land uses.

However, the size, shape and construction materials used in a development may affect the performance of aeronautical systems, such as radar and navigational aids, within 5km of an airport. Telecommunication, broadcasting or other radiating equipment can also cause electromagnetic interference to radar and navigational systems. Furthermore, lighting and reflective surfaces within 5km of an airport may dazzle or distract pilots and air traffic controllers, therefore lighting of roads,should not take a runway configuration.

However, it should be noted that the surveillance and navigation systems, including radar, operated by Airservices and by Defence are calibrated to perform within their specific environment and these systems can accommodate new developments near an airport if the new development is managed with the input of Airservices and/or Defence.

7.12.3 Mitigation Measures

The subject site is located more than five (5) kilometres to the northern extent of Runway 03C/21C at HMAS Albatross. A review of the 2014 ANEF for HMAS Albatross confirms the site is located outside of the 20 ANEF, accordingly there are no specific planning restrictions applicable under Table 2.1 of AS2021:2000.

A review of operational procedures for HMAS Albatross (Nowra Airport YSNW) published by Air Services Australia dated 2 August 2012 confirm normal procedures would not result in direct flyovers over the site, however it is acknowledged that Circuit Training Operations may result in air craft flying directly over the site at different time.

There are currently a range of planning controls in place within the Shoalhaven to ensure that landowners, residents and the general community are aware of the Air Station and its operations as part of the purchase and development of properties. Information regarding the Air Station is provided on Section 149 (zoning) Certificates, the Shoalhaven Local Environmental Plan 1985 identifies an "airport buffer zone" and provides planning controls associated with it and information can/is provided with rate notices in affected areas.

Maps are also available at Council's City Administrative Centre, Bridge Rood, Nowra that show the military aircraft operating areas around HMAS Albatross and these detail operating heights, flight frequency etc.

The Defence (Areas Control) Regulations 1989 also contain requirements for when structures of certain heights within “affected land” requires approval from the department of Defence. The Nowra area is covered by the Nowra Airfield maps provided in Schedule 6 of the regulations.

7.13 Cumulative Impact

7.13.1 Existing Environment

There are currently six other allotments surrounding the subject site that are included within the Mundamia Masterplan for future residential development. These lots total an area of approximately 36.2ha and an additional 61.81ha lot for a future school site. These lots include:

- Lot 3 DP 568613
- Lot 384 DP 755952
- Lot 2 DP 568613
- Lot 1 DP 568613
- Lot 474 DP 1102909

- Lot 6 DP 1156684 (Future school site / expansion of university)

7.13.2 Potential Impacts

Below are the potential cumulative impacts of the proposed subdivision and associated infrastructure and dwellings:

- Increased pressure on the infrastructure and services of the local area including water supply, electricity, waste disposal and gas.
- Increased pressure on the social infrastructure such as health care and public schools.
- A reduction in the biodiversity of the local area.
- Climate change is the end result of high quantities of greenhouse gases, including carbon dioxide and methane, being emitted into the atmosphere. These gases are produced mainly as the by-product of energy generation and use.
- An increased bushfire risk to the local community.

7.13.3 Mitigation Measures

We are of the opinion that overall, the proposed 109 lot subdivision will only have a minimal cumulative impact on the local environment. The subdivision layout has been designed to protect a large portion of the existing natural environment, and to reinforce the street pattern within the local area. The proposed road network caters for all road users including, pedestrians, cyclists, cars and buses. Overall the objective of the subdivision layout is to provide a safe, attractive, energy efficient and liveable neighbourhood that fosters a sense of community and that promotes better social, economic and environmental sustainability.

While it recognised that the continued expansion of Mundamia has the potential to place strain on the existing services and infrastructure the nature of the proposed subdivision is that of small-scale residential release development. As already discussed the proposal has been designed so that there is adequate capacity within the local services/infrastructure to handle the increase in population.

The existing environment, potential impacts and mitigation measures that will be implemented to reduce the environmental impact have been discussed throughout Section 7 and a Draft Statement of Commitments for the proposal is provided in Section 8.

Furthermore, a Construction Environmental and Waste Management Plan (CEWMP) will be prepared for each stage of the development. The aim of a CEWMP is to establish the overall principles and philosophy (environmental requirements, outcomes and performance indicators) to be employed during the construction works to minimise the risk to the environment. The objectives of the CEMP are to:

- Highlight the key sources of impact associated with the project;
- Define strategies for managing and mitigating the sources of impact to achieve a desired outcome;
- Identify the desired outcomes for the identified sources;
- Define criteria upon which to assess the performance of each aspect in achieving the desired outcomes;
- Establish how performance against each criteria is to be monitored, evaluated and reported on;
- Identify what corrective actions should be undertaken should the criteria not be met;
- Set out individual and general responsibilities as well as a management structure;
- Comply with all the relevant development consent requirements; and
- Fully comply with all environmental legal requirements.

The CEWMP is the essential link between environmental impact assessment and project activities. It will be prepared to ensure that environmental impacts identified during the assessment stage are properly managed on site and control measures are implemented. Procedures for environmental management during construction activities will be outlined in the CEWMP. The procedures will identify specific commitments, actions and conditions to ensure that the environmental management requirements are managed effectively. A number of management measures will be covered in the CEWMP to minimise potential environmental impacts during construction. These include:

- Air Emissions i.e dust suppression, stockpile protection;
- Flora and Fauna;
- Hazardous Materials i.e bunding for chemical storage;
- Noise and Vibration i.e appropriate working hours, appropriate mufflers on construction equipment;
- Traffic Management;
- Waste Management i.e best practice waste management; and
- Soil and Water Management i.e erosion and sediment controls.

Environmental management activities and mitigation measures identified in the CEWMP will be monitored on a regular basis and/or following major changes to operations or equipment to ensure that the objectives and targets of the CEWMP are achieved.

8 DRAFT STATEMENT OF COMMITMENTS FOR THE PROJECT

8.1 Aims

The proponent is committed to minimising the potential for environmental impacts from the proposed residential subdivision. The measures that the proponent will implement to minimise any potential environmental, social and economic impacts are outlined in Table 8.1.

8.2 Draft Statement of Commitments

Table 8.1: Draft Statement of Commitments

Item	Commitments	Timing
General	The developer will carry out the development in accordance with this Environmental Assessment Report (EAR), prepared by SET Consultants Pty Ltd dated December 2012, plans prepared by SET Consultants Pty Ltd and supporting reports.	For the duration of the subdivision.
Legislative Controls/ Requirements	The developer will obtain and maintain the following licences, permits and approvals for the residential subdivision: • Shoalhaven City Council - Construction Certificates for engineering works for each stage of the subdivision. The application for Construction Certificates will contain Design Drawings submitted containing, where relevant, detailed designs relating to earthworks, drainage, Soil erosion and Sediment Control and site rehabilitation, tree clearing and site stability, roadwork's, water supply and sewerage works, and landscaping. • Shoalhaven City Council - Road Opening Permit from Shoalhaven City Council as required; • Shoalhaven City Council - Section 138 Consent for roadworks (Roads Act 1993); • Integral Energy - Design Certification; • Integral Energy - Notification of Arrangement; • Telstra - Compliance Certificate; • Shoalhaven Water - Compliance Certificate; • Shoalhaven City Council – Subdivision Certificates for each stage.	For the duration of the subdivision.
Final Plan of Subdivision	• The developer will prepare a final plan of subdivision and Section 88B instrument for each stage of the development in accordance with the recommendations of the Environmental Assessment and requirements of Shoalhaven City Council. • The developer will lodge the final plan of subdivision and Shoalhaven City Council subdivision certificates for each stage with the Department of Land and Property Information to obtain registration of the subdivision.	Prior to the issue of Subdivision Certificates for each stage. Prior to the issue of new DP and lot titles for each stage.
Water Cycle Management	A stormwater recharge infiltration system (SRIS) has been designed and will be implemented as part of the construction phase of the development.	During the construction phase for each stage.

Item	Commitments	Timing
	The SRIS will supply supplementary recharge at rates detailed in Table 6 of the report *"Hydrological Assessment: Proposed Sub-division, Mundamia Release Area, Mundamia NSW,"* June 2011 (Appendix 6).	For the duration of the subdivision.
	Design of infrastructure including roads and other structures must ensure that they do not impede, redirect or otherwise modify current off-site groundwater drainage patterns as described in *"Hydrological Assessment: Proposed Subdivision, Mundamia Release Area, Mundamia NSW,"* June 2011.	During the construction phase for each stage.
	The developer will design and install water quality control measures in accordance with the following:	
	• Roadside bioremediation swales located on one side of single cross-fall roads designed to treat stormwater flows from roads and lots, provides surface conveyance of flows to downslope treatment measures and provide areas for landscape planting.	During the construction phase for each stage.
	• Site pit and pipe network pits and pipes designed to adequately convey the design peak storm event to site stormwater management measures.	During the construction phase for each stage.
	• Gross pollutant traps located upstream of OSD and wetlands to capture gross pollutants.	During the construction phase for Stages 1, 3 and 4.
	• OSD basins to capture stormwater flows from site areas and attenuate post-development peak discharges.	During the construction phase for Stages 1, 3 and 4.
	• Wetlands located within OSD basins to further treat stormwater flows.	During the construction phase for Stages 1, and 3.
	The developer will prepare an erosion and sediment control plan to control run off during construction in accordance with the principles of the Landcom publication Managing Urban Stormwater: Soils and Construction Volume 1, 4th Edition and Construction Certificate Plans approved by Shoalhaven City Council and DCP 100.	Prior to the issue of the Construction Certificate for each stage.
Flora and Fauna	The developer will manage vegetation and habitat in accordance with the commitments:	
	• A stormwater recharge infiltration system (SRIS) has been designed and will be implemented as part of the construction phase of the development.	During the construction phase for each stage.
	• A worker induction program will be implemented to prevent damage to adjoining habitats.	During the construction phase for each stage.
	• Sediment and erosion controls will be employed prior to any work commencing on the land and maintained on a regular basis for as long as necessary.	During the construction phase for each stage.
	• Black She-oak trees will incorporated into the landscape	During the design for the

Item	Commitments	Timing
	design where appropriate as foraging resources for the threatened Glossy Black-cockatoo. • Invasive plant species will not be used for landscaping purposes. • Pre-clearing surveys will be undertaken prior to the removal of hollow-bearing trees. • Protocols for removing hollow-bearing trees will include tree felling at least one day after clearing of other vegetation and lowering of hollow sections to the ground to allow inspection by ecologist or wildlife handler.	landscape plan for each stage. During the construction phase for each stage.
Bushfire Risk	**Provision of Asset Protection Zones** The developer will establish Asset Protection Zones (APZs) in accordance with the • 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. **Provision of Services** The developer will construct the road network and install relevant infrastructure in accordance with the recommendations outlines in Section 7.6.3. **Restriction as to User** The developer will impose a Section 88B Restriction as to User on the title of relevant allotments specifying required Asset Protection Zones (APZs) and in accordance with mitigation measure outlined in Section 7.7.6 (Table 7.3).	Prior to the issue of the Subdivision Certificate for each stage. Prior to the issue of the Subdivision Certificate for each stage. On registration of the plan of subdivision for each stage.
Acid Sulfate Soil	The developer will manage Acid Sulphate Soils in accordance with the following: • The developer will prepare an acid sulphate soil management plan. • The soil excavated during construction of the areas identified as containing ASS will be treated and disposed of in accordance with ASSMP.	Prior to the issue of the Construction Certificate for stage 1. During Construction of Stage 1.

Item	Commitments	Timing
Contamination	The developer will manage contaminated fill in accordance with the following: • The developer will prepare a remediation action plan. • The fill material excavated during construction of the areas identified as being contaminated will be treated and disposed of in accordance with remediation action plan.	Prior to the issue of the Construction Certificate for stage 1. During construction of Stage 1.
Landscaping	All landscaped areas, of public land including parks, road reserves, entry statements and water quality detention areas will be maintained for a period of 12 months from the dedication of the land to Council.	For 12 months from the dedication of the land to Council.
Public Open Space and Water Quality/Quantity Treatment Devices	The developer will dedicate Lot 25, 77 and 90 and retention basin within Part Lot 458 (11,093m^2) to Shoalhaven City Council for the purposes of public reserve, stormwater management and pedestrian access. The Proponent will make the necessary arrangements for the dedication of the following open space areas and water quality/quantity treatment devices to Council prior to the release of the Subdivision Certificate for the following stages: • bio-remediation swales as part of the public road network within each stage will be dedicated to Council on release of the Subdivision Certificate for each stage. • Lot 25 will be dedicated to Council on release of the Subdivision Certificate for Stage 5: • Lot 77 will be dedicated to Council on release of the Subdivision Certificate for Stage 7; and • Lot 90 and the OSD Basin and Wetland on the north side of Jonsson Road (Part Lot 458) will be dedicated to Council on release of the Subdivision Certificate for Stage 8. The open space will be embellished in accordance with the Landscape Plan 5221_01 (April 2013) prepared by Shoalhaven City Council and provided in Attachment 12. Where possible, landscaping in the open space and road reserves will be from locally sourced plant species. The proponent will liaise with Council on the detailed design of the detention basins and wetlands in accordance with Council's requirements. Such liaising shall occur prior to the release of the Construction Certificate for the relevant stages. <u>Maintenance of Water Quality/Quantity Treatment Devices</u> 1. The bio-remediation swales contained within each stage will be maintained until 80% of dwellings are erected in that stage or for a period of 2 years from the registration of the linen plan, whichever occurs first. 2. The Gross Pollutant Trap, Wetland and Onsite Site Detention Basin provided within Lot 25 will be maintained for a minimum period of 2 years from the registration of the linen plan for stage 5, prior to Council maintaining Water Quality Structures. Prior to the issue of a Subdivision Certificate for Stage 5 of the subdivision, a	On registration of the plan of subdivision for: • Stage 5 – Lot 25; • Stage 6 – Lot 77; and • Stage 8 – Lot 90 and retention basin with Part Lot 458

Item	Commitments	Timing
	deed of agreement will be prepared with Council to allow the proponent to carry out management and maintenance works required for the water quality/quantity treatment devices. 3. The Gross Pollutant Trap and Onsite Site Detention Basin provided within Lot 77 will be maintained until 80% of lots within that stage have been sold or for a period of 2 years from the registration of the linen plan, whichever occurs first, prior to Council maintaining Water Quality Structures. Prior to the issue of a Subdivision Certificate for Stage 7 of the subdivision, a deed of agreement will be prepared with Council to allow the proponent to carry out management and maintenance works required for the water quality/quantity treatment devices. 4. The Gross Pollutant Trap, Wetland and Onsite Site Detention Basin provided within Lot 90 Part Lot 458 on the northern side of Jonsson Road will be maintained for a minimum period of 2 years from the registration of the linen plan for stage 8, prior to Council maintaining Water Quality Structures. Prior to the issue of a Subdivision Certificate for Stage 8 of the subdivision, a deed of agreement will be prepared with Council to allow the proponent to carry out management and maintenance works required for the water quality/quantity treatment devices. An operation and maintenance manual will be prepared to ensure the correct monitoring, maintenance and management of the proposed water quality/quantity treatment devices to be installed. Water quality/quantity treatment devices will be inspected and cleaned routinely to ensure that litter accumulation does not become excessive. System monitoring will be undertaken to ensure that adequate infiltration into the filter media is maintained. The level of maintenance of the water quality/quantity treatment devices will be as a minimum in accordance with following: • General surface maintenance or garden areas including regular mowing, weed removal and pruning. • General litter and rubbish removal from open space areas and water quality/quantity treatment devices. • Removal of any sediment build up from water quality/quantity treatment devices. • Remediation of any scouring from outlets or channelling through the basin area. • Vegetation management will be undertaken to ensure that systems do not become clogged with dead and decaying vegetation and to ensure that vegetation does not block water flow through the systems. Maintenance requirements for vegetation will depend on the nature of the plants and will be developed in detail as part of the final project landscape management plan.	
Construction	The developer will prepare a Construction Environmental and Waste Management Plan for approval by Shoalhaven Council. The plan will include education of workers on the conditions requiring compliance (including soil erosion and sediment controls, flora and fauna), details of the environmental management procedures, which are to employed during construction and measures relating to waste minimisation and	Prior to the issue of the Construction Certificate for each stage.

Item	Commitments	Timing
	management.	
Infrastructure	**Roads** The developer will construct the following roads and associated drainage (i.e rain gardens/bio-retention): *Stage 1* • Part of the Spine Road (unformed crown road) to Lot 24 • All of Road 6; • Road 1 from George Evans Road to Road 2 • Road 2 from Spine Road (unformed crown road) to Road 1. • Lane 1. • George Evans Road adjacent to Lot 1 to 4. *Stage 2* • 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. *Stage 3* • Road 3 from Road 1 to Road 5. • Road 4 from Road 1 to Road 5 • Road 5 from Road 3 to Road 4. *Stage 4* • Road 1 from Road 3 to Road 4. • Road 3 from the Spine Road (unformed crown road) to Road 5. • Road 4 from Spine Road (unformed crown road) to Road 5. • Spine road from village centre to Road 4 *Stage 5* • 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. *Stage 6* • Spine road (unformed crown road)) from Road 4 to Jonsson Road • Jonsson Road adjacent to Lots 83 and 84. *Stage 7* • Road 5. *Stage 8* • Jonsson Road from Road 1 to 85. The developer will provide street signs in accordance with the requirements of Shoalhaven City Council. **Electricity and Telecommunications** The developer will provide underground power to each residential lot in	Prior to release of the subdivision for each stage. Prior to release of the

Item	Commitments	Timing
	the subdivision in accordance with the requirements of Integral Energy The developer will provide underground telecommunications infrastructure to each lot in the subdivision in accordance with requirements of Telstra. **<u>Water and Sewer Services – Residential Allotments</u>** The developer will provide reticulated water, and sewerage services to each lot in the subdivision in accordance with the requirements of Shoalhaven Water.	subdivision certificate for each stage. Prior to release of the subdivision certificate for each stage.

9 PROPOSAL JUSTIFICATION

9.1 Alternative Layouts

The original subdivision layout was for a proposed 115 lot subdivision of the subject site (Figure 9.1) with associated village centre and public open space. The proposed subdivision layout comprised a mixture of single lot residential (95 lots), dual occupancy residential (8 lots), medium density residential (5 lots), commercial (3 lots) and public open space (5 lots).

This layout design included the division of the commercial component into three (3) separate lots with specific uses listed (child care centre, community centre and neighbourhood shops). The village centre also included adjoining public open space and a medium density allotment (Lot 39).

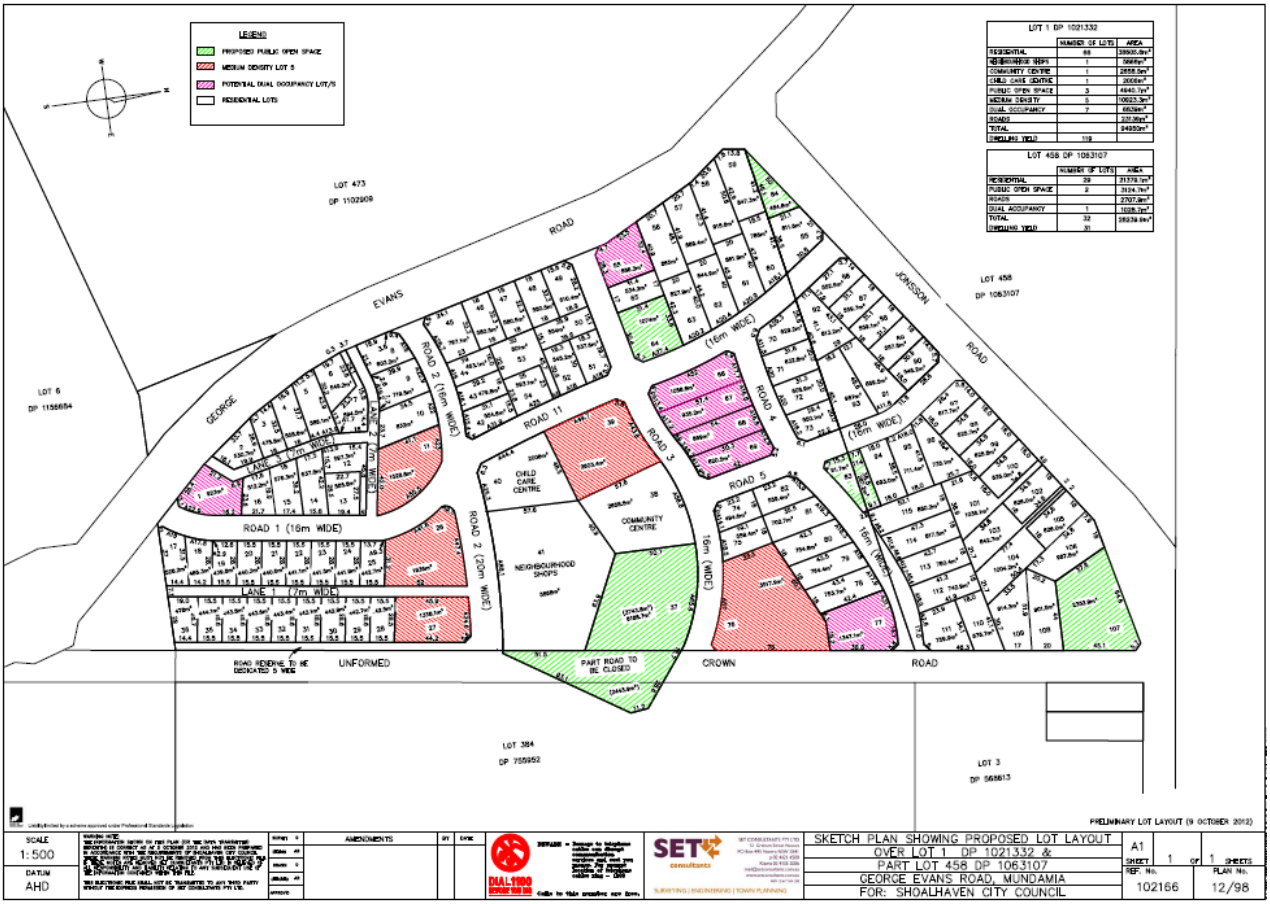

Figure 9.1: Original Subdivision Layout

Alternative Layout

The main modifications to alternative layout (Figure 9.2) when compared to the original layout (Figure 9.1) are:

- The village centre was modified from five (5) lots into two (2) lots, comprising of once commercial lot and one public open space lot.
- The commercial component of the subdivision was relocated to front the spine road so as to provide greater service to the adjoining subdivision on Lot 384 DP 755952 which is a part of the Mundamia Masterplan.

- The number of public open space lots were reduced to four (4), dual occupancy lots were reduced to six (6) and the number of medium density lots were increased to six (6).
- Road 5 was modified to service the lots internally in the north east corner of the site. This reduces the number of battle-axe allotments as well as the number of lots accessed off Jonsson Road.
- The medium density lots were designed to surround the village centre and the roads were modified so as to provide laneway access to all medium density lots.

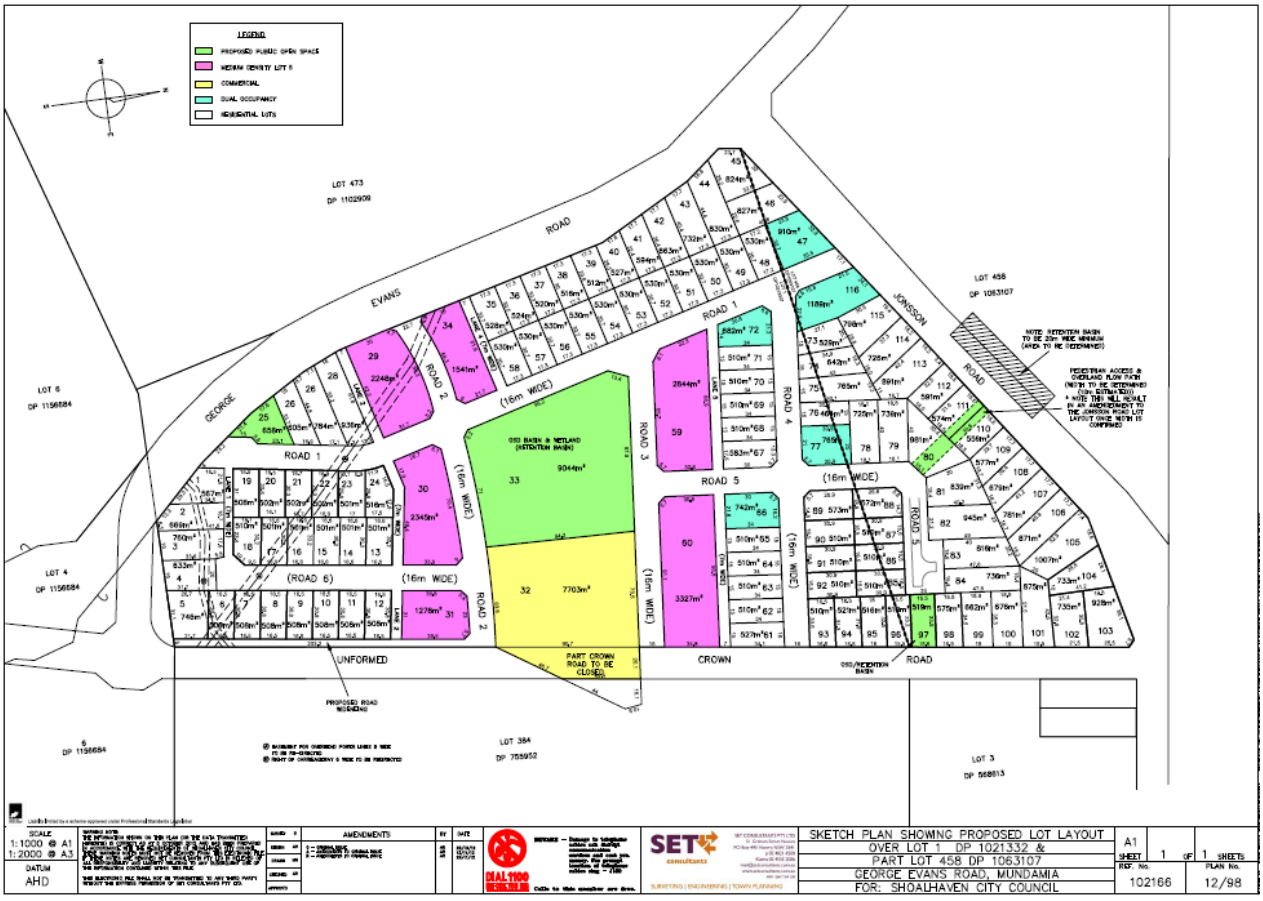

Figure 9.2: Alternative Layout 1

Alternative Layout 2

The main modifications to the alternative layout 2 (Figure 9.3) when compared to the alternative layout 1 (Figure 9.2) are:

- Lots previously under 500m^2 have been modified so as to have all allotments over 500m^2 to comply with the minimum lot size under the LEP.
- The number of dual occupancy lots was reduced to five (5) lots.
- The previous lots along the spine road in the south east corner of the site have been consolidated to form one (1) large medium density allotment (Lot 5).
- Laneways to service medium density lots have been removed.
- A public open space allotment (Lot 90) has been positioned so as to provide pedestrian access from the north of the subject site and also be used as an overland flow path.
- A retention basin (20m wide minimum) has been positioned within the road reserve in Jonsson Road.
- An on-site retention basis has also been included within proposed Lot 77.

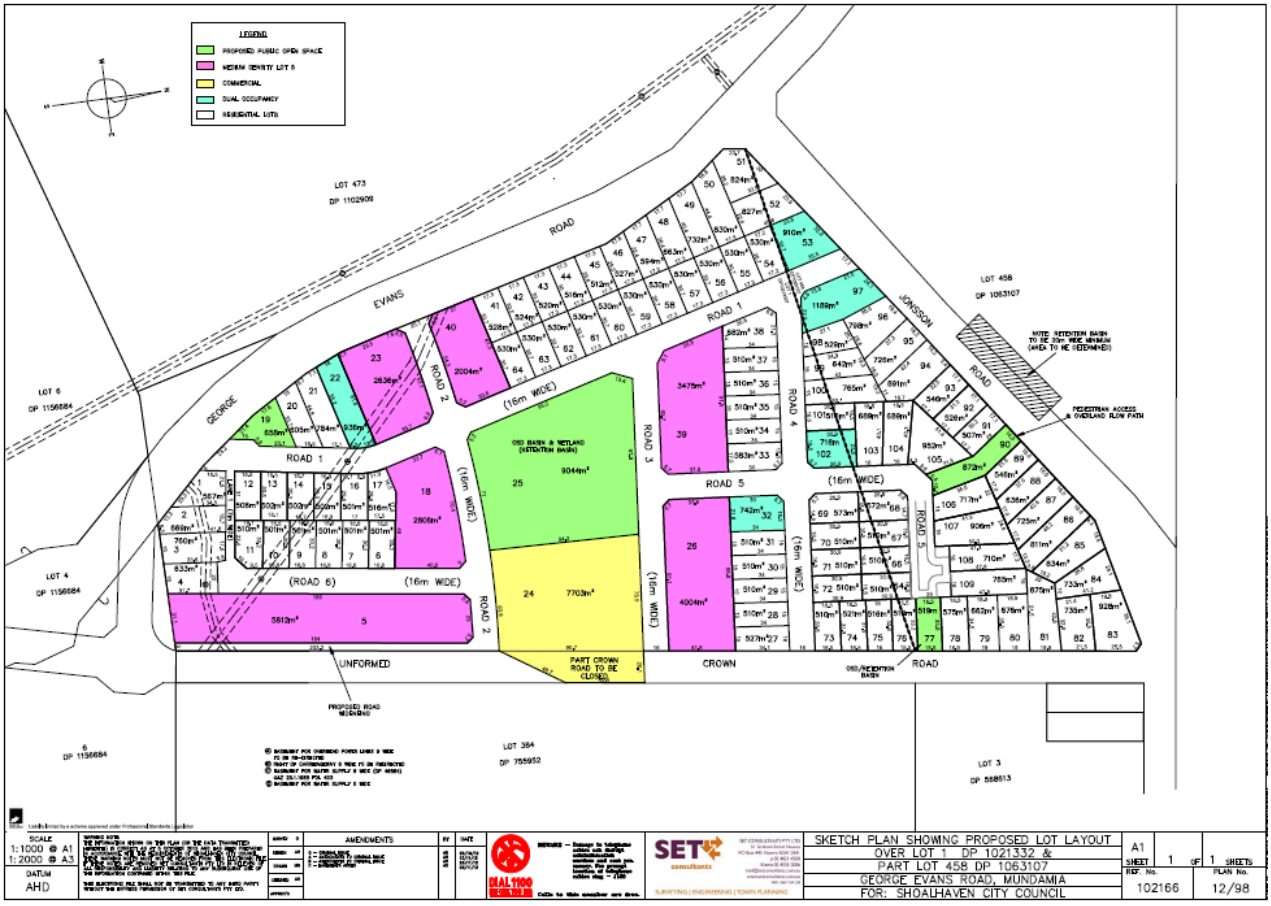

Figure 9.3: Alternative Layout 2

Alternative Layout 3 (Proposed Layout)

The main modifications to the alternative layout 3 (Figure 9.4) when compared to the alternative layout 1 (Figure 9.3) are:

- Road 1 (from Lot 25 to Lot 97), Road 2 and Road 3 have been increased in width from 16m to 18m.
- Lots 4, 5, 18, 19, 23, 24, 25, 26, 39, 40, 38 and 97 have all had a minor reduction in area due to the increased road widths.
- Lot 19 is now to be a low density residential lot.
- Round-a-bouts have been included at the end of Road 1, Road 5 and Road 6.

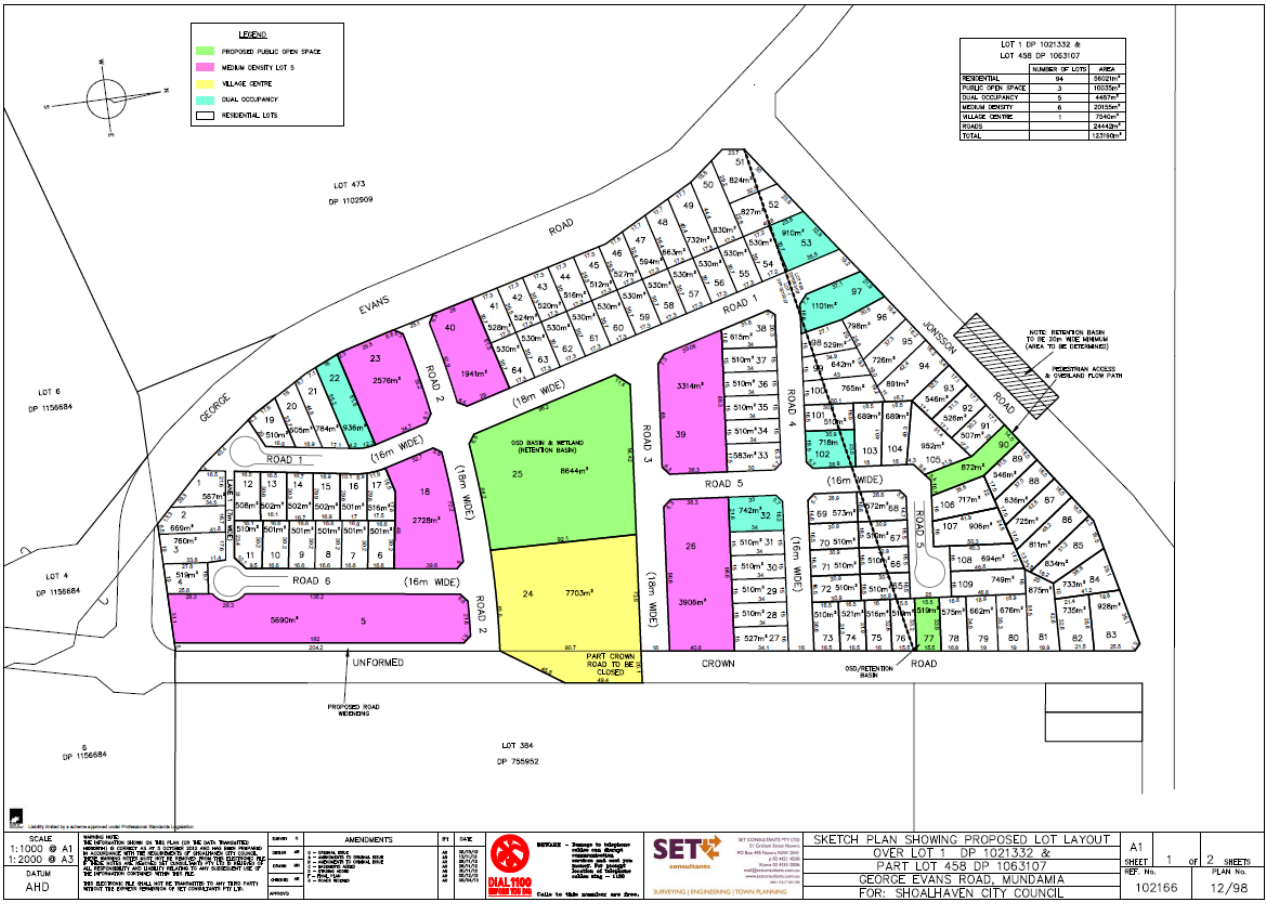

Figure 9.4: Alternative Layout 3 (Proposed layout)

9.2 Justification

The general principle for development in an area with a rural setting such as this is to respect the natural environment, create an appropriate edge and to provide visual and physical linkages between the existing character and the proposed urban setting.

The urban design principles used in deciding which subdivision layout to use considered the inter-relationship among future buildings, streets, private open space, and publicly-accessible open spaces. The proposal seeks to establish functional relationships that foster a healthy community, add economic value, and enhance aesthetic character of the local area.

The proposed subdivision layout (alternate layout 3) was chosen as it essentially establishes a sense of place by enhancing the public domain. This is evident by the establishment of a street network, which connects the proposed development to the existing surrounds as well as future adjoining development. Furthermore the layout provides safe streets as well as pedestrian access and ample public open space areas.

9.3 Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) represents one of the greatest challenges facing industry, in the coming years. While there is no universally accepted definition of ESD, in 1990 the Commonwealth Government through the Ecologically Sustainable Development: Commonwealth Discussion Paper suggested the following definition for ESD in Australia:

…using, conserving and enhancing the community's resources so that ecological processes on which life depends are maintained and the total quality of life, now and in to the future, can be increased.

Put more simply, ESD is development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations.

ESD principles must be considered in the planning and design of development within Australia. This is reflected in giving consideration to environmental resources on which it is often difficult to place monetary values such as air, flora, fauna, hydrology, soil and public health.

The EP&A Regulation 2000, Schedule 2 defines the principles of ESD as:

(a) *precautionary principle*
(b) *inter-generational equity*,
(c) *conservation of biological diversity and ecological integrity*,
(d) *improved valuation, pricing and incentive mechanisms*,

The principles of Ecologically Sustainable Development (ESD) have been incorporated into the design of the proposed subdivision and have been taken into consideration during the preparation of the Environmental Assessment and are discussed below.

9.3.1 Precautionary Principle

The EPA's precautionary principle states that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Response

The design of the proposed subdivision has taken into consideration the results and recommendations of a number of environmental studies undertaken as part of the preparation of the EA and are discussed in section 7.

As the subject site is located within an area primarily covered in native vegetation, there will be some minor threats as a result of the development. However it is unlikely that the proposal would lead to serious or irreversible threats to the environment. Certain design mechanisms have been incorporated into the subdivision layout to preserve sections of the natural vegetation.

9.3.2 Intergenerational Equity

Inter-generational equity is aimed at the future, not the present. The aim of this principle is that the present generation should ensure that the health, diversity and the productivity of the environment is maintained or enhanced for the benefit of future generations.

Response

The essential premise is that we have a moral obligation to preserve the life supporting and resource-providing environmental systems of the earth for future generations, so that they too have an opportunity for a high quality of life.

It is recognised that the proposed subdivision will result in 11.7ha of vegetation being removed or modified. We are of the opinion that through incorporating the mitigation measures discussed in section 7 and 8 the impact on the local environmental can be reduced.

9.3.3 Conservation of Biological Diversity and Ecological Integrity

Sustainability recognises that all life has intrinsic value, is interconnected and that biodiversity and ecological integrity are part of the irreplaceable life support systems upon which the earth depends.

Response

The proposed development has been designed to achieve minimal impact on the surrounding natural environment. Measures have been implemented to avoid adverse impacts on the air, noise and water quality of the local environment. The mitigation measures are discussed in detail in Section 7 & 8.

9.3.4 Valuation and Pricing of Environmental Resources

Environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement;

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste; and

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

Response

While the proponent agrees that environmental factors should be included in the valuation of assets and services, we are of the opinion that this objective is more aimed at local, state and national government agencies that have the power to create development policies and establish incentive structures, including market mechanisms.

10 CONCLUSION

This EA demonstrates how the consultant team has addressed the key issues set out in the Director-General's Requirements and has designed a subdivision layout, which minimises its impact on the environment. This assessment demonstrates that the proposed development is consistent with local, state and national legislation and guidelines.

Where potential environmental impacts have been identified, appropriate investigations have been undertaken and the recommended mitigation measures and environmental safeguards have been either designed into the subdivision layout, or are proposed to be constructed as part of the civil infrastructure. The mitigation measures and environmental safeguards disused in sections 7 and 8 will enable the potential environmental impacts to be reduced or contained to within acceptable standards or levels.

The final design is reflective of the inherent constraints and positive attributes associated with the subject site. The proposed development utilises a range of lot sizes, from 501m^2 to 5690m^2. The variety in lot sizes proposed offers the opportunity for a diverse range of housing styles and sizes to be developed. The topography and setting of the site have been utilised in the design to ensure where possible future dwellings have a pleasant outlook to the surrounding bushland.

Having regard to the conclusions and findings contained in this EAR, we recommend to the Minister for Planning & Infrastructure that the subdivision layout as detailed in this EA be approved under Part 3A of the Environmental Planning and Assessment Act.

Council has planned for residential development to occur on the subject land at Mundamia for a considerable period of time. This is supported by the following factors:

- The New Living Area No.5 Mundamia has been included in Council's Nowra Bomaderry Structure Plan recently endorsed by the Department of Planning (February 2008);
- A rigorous analysis of the socio-economic and environmental factors was carried out in the formulation of the Structure Plan and its extensive consultation process with the public and government agencies;
- Council has adopted a s.54 resolution to prepare a Local Environmental Plan and subsequently proceed to exhibit the plan and rezone the subject land as part of the Citywide LEP; and,
- Council has identified New Living Area No. 5 Mundamia as a Phase 1 priority release area in the Structure Plan due to strategic reasons.

11 REFERENCE

Acts and Regulations

Environmental Planning and Assessment Act 1979.

Environmental Planning and Assessment Regulation 2000.

Environmental Protection and Biodiversity Conservation Act 1999.

Fisheries Management Act 1994.

Heritage Act 1977 (As Amended 1998).

Rural Fire Act 1997.

National Parks and Wildlife Act 1974.

Native Vegetation Act 2003.

Threatened Species Conservation Act 1995.

Threatened Species Conservation Amendment Act 2002.

Water Management Act 2000.

Publications

Atkins Acoustics Pty Ltd. 2012. Noise Impact Assessment. Subdivision of Lot 1 DP1021332 & Part Lot 458 DP 1063107, George Evans Road, Mundamia.

Bushfire and Environmental Services (BES). 2004a. Flora and Fauna Assessment, Nowra Bomaderry Structure Planning Study, Area 5 Mundamia, West Nowra. Unpublished report for Shoalhaven City Council. BES, St Georges Basin.

Bushfire and Environmental Services (BES). 2004b. *Pterostylis vernalis* survey, Nowra Bomaderry Structure Planning Study, Area 5 Mundamia, West Nowra. Unpublished report for Shoalhaven City Council. BES, St Georges Basin.

Bitzios Consulting. 2012. Traffic Impact Study. Subdivision of Lot 1 DP 1021332 & Part Lot 458 DP 1063107, George Evans Road, Mundamia. Report prepared for Shoalhaven City Council.

Centre Mapping Authority. 2006. 1:25000 topographical map, reference Nowra 9028-3-S.

Chapman and Murphy. 1983. Wollongong 1:100 000 Soil Landscapes Sheet 9130.

Commonwealth of Australia. 2006, Bureau of Meteorology. http://www.bom.gov.au/index.shtml.

Commonwealth of Australia (Geoscience Australia). 1966. WOLLONGONG 1:250,000 MAPSHEET 2nd ed. Mapsheet ID: SI5609

Department of Mineral Resources. 1983. Wollongong 1:100,000 Geological Sheet 9130.

Eco Logical Australia Pty Ltd. 2012. Flora and Fauna Assessment Lot 1 DP1021332 George Evans Road, Mundamia. Report prepared for Shoalhaven City Council.

Geological Survey of NSW, Department of Minerals and Energy (1991), Geological Series: 1:100,000, Wollongong Sheet.

Martens & Associates. 2012a. Hydrological Assessment: Proposed Subdivision, Mundamia Release Area, Mundamia NSW. Report prepared for Shoalhaven City Council.

Martens & Associates. 2012b. Contamination Assessment: Proposed Subdivision, Lot 1 DP 1021332 & Part Lot 458 DP 1063107, George Evans Road, Mundamia, NSW. Report prepared for Shoalhaven City Council.

Martens & Associates. 2012c. Stormwater Management Assessment: Proposed Subdivision, Lot 1 DP 1021332 & Part Lot 458 DP 1063107, George Evans Road, Mundamia, NSW. Report prepared for Shoalhaven City Council.

Martens & Associates. 2012d.. Geotechnical Assessment: Proposed Subdivision, Lot 1 DP 1021332 & Part Lot 458 DP 1063107, George Evans Road, Mundamia, NSW. Report prepared for Shoalhaven City Council.

Navin Officer Heritage Consultants Pty Ltd. 2012. Aboriginal Archaeological Assessment. Subdivision of Lot 1 DP 1021332 & Part Lot 458 DP 1063107, George Evans Road, Mundamia. Report prepared for Shoalhaven City Council.

NSW Department of Planning. 2007. South Coast Regional Strategy. www.nsw.gov.au/stateplan

NSW DUAP/EPA. 1998. *SEPP 55 Managing Land Contamination, Planning Guidelines, Remediation of Land.*

NSW Government. 1986. Illawarra Regional Environmental Plan No. 1. http://www.legislation.nsw.gov.au/.

NSW Government. 2004. State Environmental Planning Policy – Building Sustainability Index: BASIX. http://www.legislation.nsw.gov.au/.

NSW Government. 2002. State Environmental Planning Policy 71 – Coastal Protection. http://www.legislation.nsw.gov.au/.

NSW Government. 2007. State Environmental Planning Policy - Infrastructure Generating. http://www.legislation.nsw.gov.au/.

NSW Government. 1995. State Environmental Planning Policy 44 – Koala Habitat Protection. http://www.legislation.nsw.gov.au/.

NSW Government. 2005. State Environmental Planning Policy 2005 - Major Projects. http://www.legislation.nsw.gov.au/.

NSW Government. 1998. State Environmental Planning Policy 55 – Remediation of Land. http://www.legislation.nsw.gov.au/.

SET Consultants. 2012. Bushfire Risk Assessment – 109 Lot Subdivision 109 Lot Subdivision (105 Residential Lots, Village Centre and Public Open Space) of Lot 1 DP 1021332 & Part Lot 458 DP 1063107, George Evans Road, Mundamia. Report prepared for Shoalhaven City Council.

Shoalhaven City Council. 2006. Shoalhaven Local Environmental Plan 1985 (as amended 2008). www.shoalhaven.nsw.gov.au/.

Shoalhaven City Council. 2005. Development Control Plan No. 93 - Controls for site waste minimisation and management. www.shoalhaven.nsw.gov.au/.

Shoalhaven City Council. 2008. Development Control Plan No. 100 Amendment No. 1 – Subdivision Code. www.shoalhaven.nsw.gov.au/.

Shoalhaven City Council. Reflective Building Materials – Use in Coastal and Rural Areas. www.shoalhaven.nsw.gov.au/.

Shoalhaven City Council. 1990. Policy to Control Building Height and Amenity in Residential Areas Shoalhaven Council. www.shoalhaven.nsw.gov.au/.

Shoalhaven City Council. *Sustainable Stormwater Guidelines.*