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PLANNING PROPOSAL

Land Subject of Planning Proposal	• Lot 404, DP: 866648 & Lot 1, DP: 1060691, Rusty Lane & Rosehill Place, Branxton

Date:	11 August 2011
File Ref:	LA73/2009
Version:	1

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PART 1 – INTRODUCTION AND OVERVIEW

Introduction

This planning proposal (Council file reference: LA73/2009) seeks to amend the *Singleton Local Environmental Plan 1996* to:

- Rezone Lot 1, DP: 1060691 from 1(a) (Rural Zone) to 1(d) (Rural Small Holdings Zone).
- Rezone that part of Lot 404, DP: 866648 south of Rusty Lane from 1(a) (Rural Zone) to 1(d) (Rural Small Holdings Zone). The zoning of the triangular piece of Lot 404, DP: 866648, north of Rusty Lane is proposed to remain 1(a) (Rural Zone). This is consistent with the Singleton Land Use Strategy.
- Apply a minimum lot size of 8,000m^2 and a minimum average lot size of 1Ha to subdivision of the land forming Lot 1, DP: 1060691 and that part of Lot 404, DP: 866648 south of Rusty Lane. This is intended to be implemented via a Lot Size Map and not a written averaging provision.
- Apply a minimum lot size of 7,000m^2 to subdivision of the triangular piece of Lot 404, DP: 866648 north of Rusty Lane.
- Require Development Control Plan (DCP) provisions to be prepared for the site to help achieve suitable design outcomes for the site.

Lot 404, DP: 866648 is 41.09ha in area and Lot 1, DP: 1060691 is 3842m^2 in area. Based on the proposed minimum lot size provisions for subdivision, topographical constraints and assuming that approximately 15% of the site is likely to be utilized for roads; subdivision of the land is expected to yield approximately 35 rural-residential style allotments. The prospective lot yield would be further clarified as part of the DCP master-planning process.

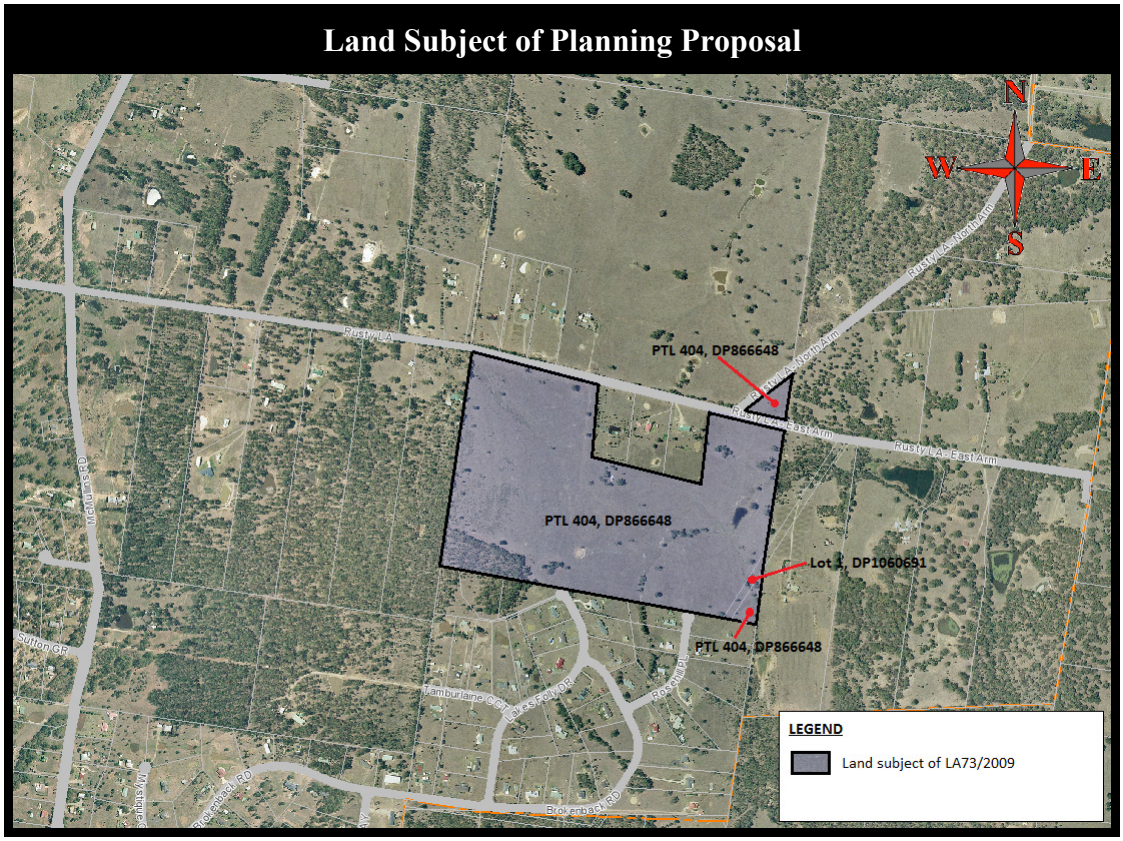
The following information/studies (in a form which complies with Council's requirements) are considered to be required should this planning proposal be supported by gateway determination:

- An Ecological Assessment Report for the proposal, which incorporates a Biodiversity Impact Assessment (prepared in accordance with the Environmental Outcomes Assessment Methodology of the *Native Vegetation Regulation 2005*);
- Aboriginal Cultural Heritage Assessment Report ;
- Bushfire Impact Assessment Report;
- Traffic Impact Assessment Report;
- Reticulated Water Servicing Strategy;
- Geotechnical Study; and
- A proposal to amend the Singleton Development Control Plan.

It is intended to require the proponent to lodge the DCP amendment proposal with Council following initial public authority consultation. The requirements of public authorities could then be considered when developing the DCP plans/ provisions. The road alignment and lot boundaries of the concept subdivision layout would be used as a basis for locating the boundaries of the minimum lot size areas for the LEP Lot Size Map.

Site Description

The site subject of this planning proposal is identified in the plan which follows.

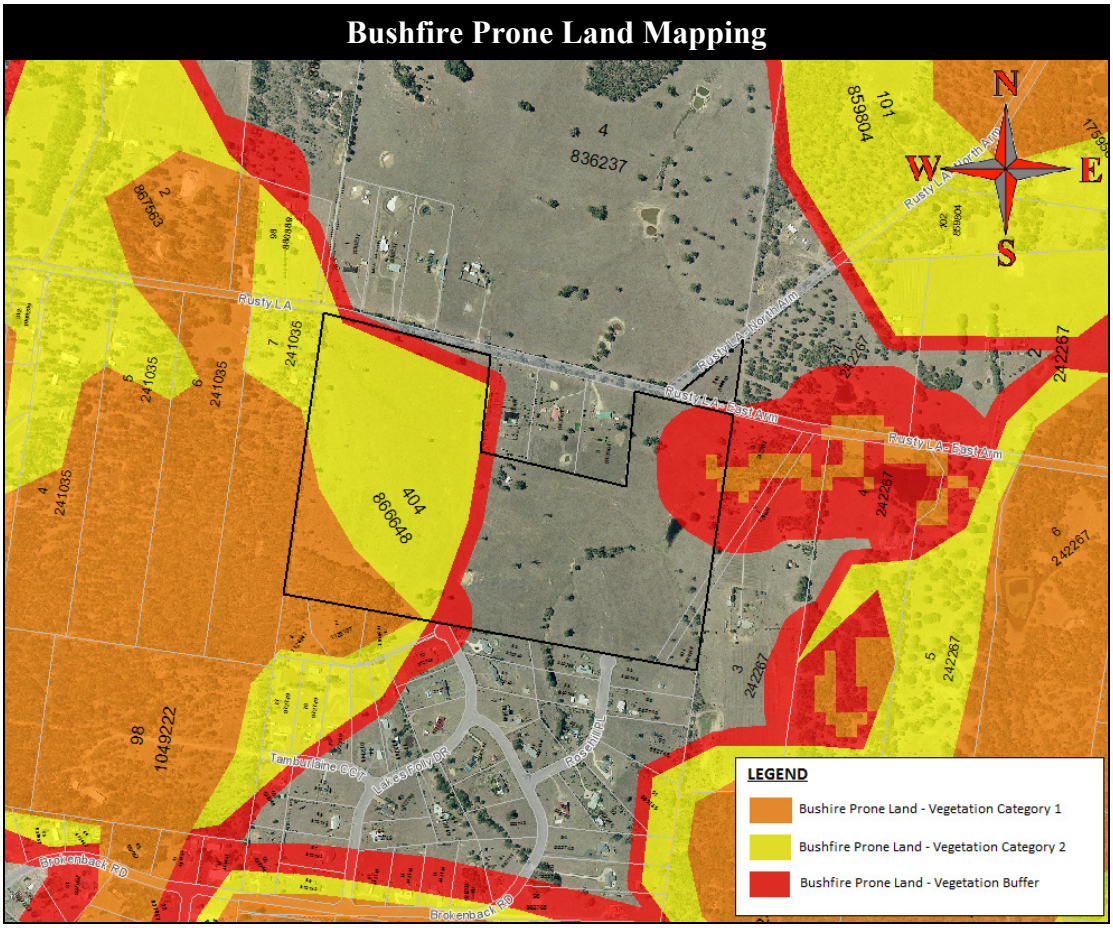


The site is in the locality of Branxton, which is within the Singleton Local Government Area (LGA) and is situated north of the cul-de-sac heads of Lakes Folly Drive and Rosehill Place and south of Rusty Lane.

The site has a hilly topography. In particular, the eastern half of the site comprises some substantial slopes.

Contour Plan

The site is identified on Council's Bushfire Prone Land mapping as being bushfire prone land.



The proponent has lodged an Archeological Assessment report which was prepared in 1997 for proposal, separate from this planning proposal. The study does not appear to comply with current requirements for preparing Aboriginal Cultural Heritage Assessment reports and as such, it is recommended that new study be prepared for the site in accordance with current requirements.

PART 2 – OBJECTIVES/INTENDED OUTCOMES OF PROPOSED LEP

Objectives

The intention of this planning proposal is to rezone the land to deliver rural-residential development on a site that is recognized by the Singleton Land Use Strategy (SLUS) as being suitable for rural-residential development.

The objectives of the proposed LEP are:

(a) To change the land use zoning of the component of the site which lies south of Rust Lane to a rural-residential type zoning, to appropriately correspond to the minimum lot sizes and constraints of the site.

(b) To apply minimum lot size provisions to subdivision of the land.

(c) To require development control plan (DCP) provisions to be prepared for the site to the satisfaction of Council.

Intended Outcomes

Council is currently operating under the *Singleton Local Environmental Plan 1996* (SLEP 1996). Like most Councils in NSW, Singleton Council is in the process of drafting a new local environmental plan (LEP) in accordance with the LEP standard instrument (SI) template. The SI LEP will replace the SLEP 1996.

Preparation of Singleton Council's SI LEP is not prioritized by the NSW Department of Planning and Infrastructure as reflected in its list of SI LEPs proposed to be fast-tracked; which was publicized in 2009.

Additional funding under the NSW Department of Planning and Infrastructure's "Local Environmental Plan Acceleration Fund" was granted to Council in April 2011. The availability of the funding led to Council revising its scheduled tentative timeframes for preparing, exhibiting and adopting its SI LEP. Council aims to lodge the draft LEP with NSW Department of Planning and Infrastructure with a request that the plan be made by the 4 June 2012.

Factors outside of Council's control (e.g. Public Authority and Community submissions) could potentially impact upon scheduled timeframes. Therefore the actual time for completion of the SI LEP is subject to change.

Council is currently processing rezoning proposals separately from the new SI LEP to simplify and streamline the process of developing the SI LEP. Separating the process

enables the matters associated with individual rezoning proposals to be resolved without affecting the SI LEP process.

The method of satisfying the objectives of this planning proposal will differ according to whether or not the amendment occurs to the SLEP 1996 or the SI LEP.

PART 3 – EXPLANATION OF THE PROVISIONS TO BE INCLUDED IN THE LEP

Explanation of Provisions

Amendment under the Singleton Local Environmental Plan 1996

Description

Implementation of this planning proposal as an amendment to the SLEP 1996 would involve:

- Utilization of the 1(d) (Rural Small Holdings zone) for the site.
- Creation of a Locality Map, Zoning Plan and Lot Size Map for the site.
- Creation of a clause following clause 14E of the SLEP 1996, which requires a development control plan to be prepared for the site.
- Modification of the definition of 'Lot Size Map" in clause 9(1) of the SLEP 1996 to include the subject amendment.
- Modification of the definition of "the map" in clause 9(1) of the SLEP 1996 to include the subject amendment.

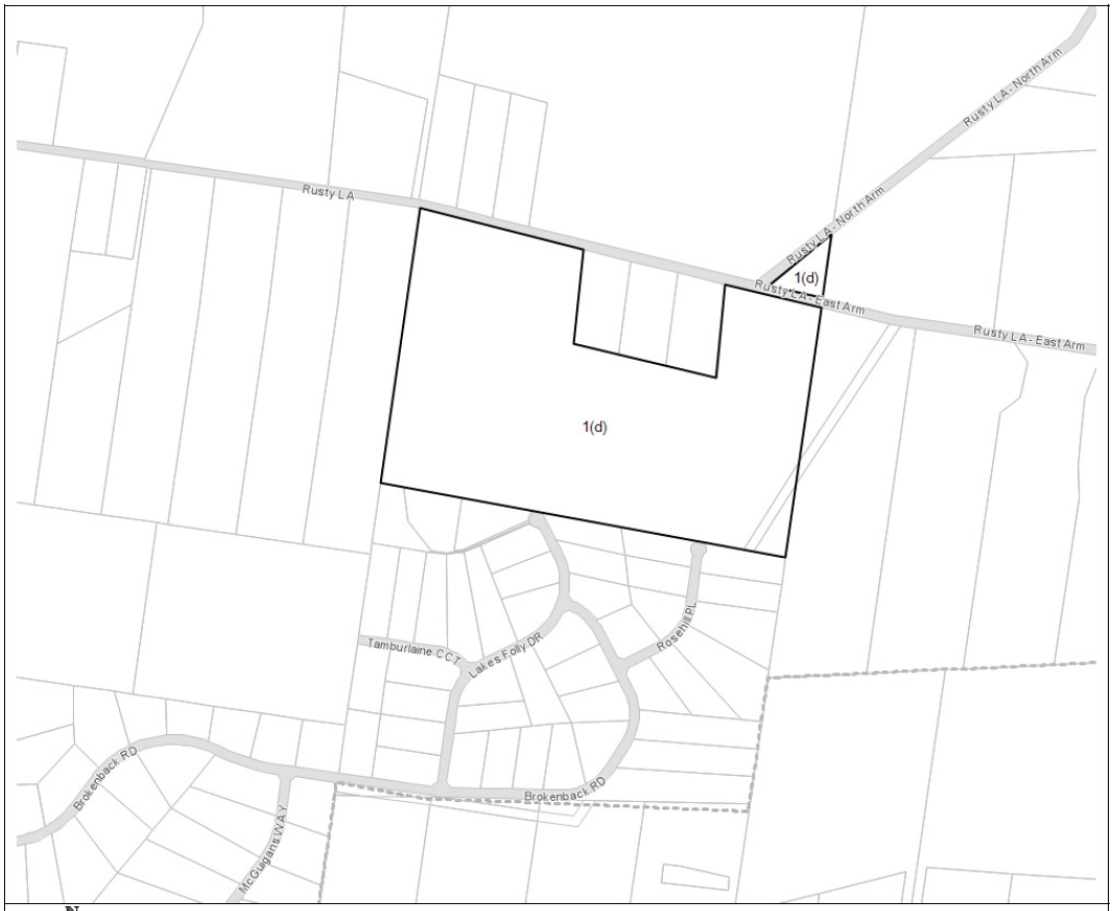
Zoning

It is intended to apply a minimum lot size of 7,000m^2 to subdivision of the triangular section of Lot 404, DP866648 that is north of Rusty Lane. This is to provide for the allotment to be excised off of the Branxton North East Candidate Area. A minimum lot size of 8,000m² and a minimum average lot size of 1ha, is proposed for subdivision of that component of the site which is south of Rusty Lane.

Lot size provisions are intended to be implemented via a lot size map, which designates specific minimum lot sizes to specific areas of the site, such that the overall site outcome (i.e. average of the respective minimum lot size areas) achieves the minimum 1Ha average. This approach is consistent with the recommendations of the SLUS and the advice from the NSW Department of Planning and Infrastructure which indicates that a stand alone written averaging provision should not be used across the overall site.

The 1(d) (Rural Small Holdings Zone) is viewed to be appropriate for the component of the site which lies south of Rusty Land in light of the proposed lot sizes, large areas of relatively cleared land and the existence of the 1(d) (Rural Small Holding zone) land adjacent to the property.

The 1(d) (Rural Small Holdings zone) provides for rural-residential development in appropriate locations, taking into account natural constraints. The plan which follows shows the area which is intended to be rezoned by this planning proposal.



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W E
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ZONING PLAN

Zone – 1(d) Rural Small Holdings

LOCALITY	Branxton	PARISH	Branxton	COUNTY	Northumberland

ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1979

DRAFT
SINGLETON LOCAL ENVIRONMENTAL PLAN 1996
(AMENDMENT NO. ■)

DRAWN BY	DATE	SCALE	SHEET
SUPERVISING DRAFTSPERSON		STATEMENT OF RELATIONSHIP WITH OTHER PLANS THIS PLAN AMENDS THE SINGLETON LOCAL ENVIRONMENTAL PLAN 1996 IN THE MANNER SET OUT IN SCHEDULE 1	
PLANNING OFFICER			
COUNCIL FILE NUMBER			
DEPT. FILE NUMBER			
Gateway Determination Date:		CERTIFIED IN ACCORDANCE WITH THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979, AND REGULATIONS	GENERAL MANAGER/DELEGATE DATE
Published on NSW Legislation website on:			

Objectives

The following objectives of the 1(d) (Rural Small Holdings zone) as contained in the SLEP 1996, would apply to the proposal:

(a) to facilitate and provide for rural residential development in appropriate locations, taking into account natural constraints,

(b) to maintain and enhance the amenity and landscape quality,

(c) to provide for adequate, efficient and orderly servicing.

Definitions

The definitions to be modified would include:

- Modification of the definition of "***Lot Size Map***" of clause 9(1) of the SLEP 1996 to include the subject amendment.
- Modification of the definition of "***the map***" of clause 9(1) of the SLEP 1996 to include the subject amendment.

Minimum Lot Size

The LEP amendment would apply minimum lot size requirements for subdivision of the land using a Lot Size Map as referred to by Clause 11 of the SLEP 1996. To achieve compliance with the requirements of the NSW Department of Planning and Infrastructure, the Lot Size Map for the site must not have a written averaging provision. Instead, it is only to identify absolute minimum lot sizes.

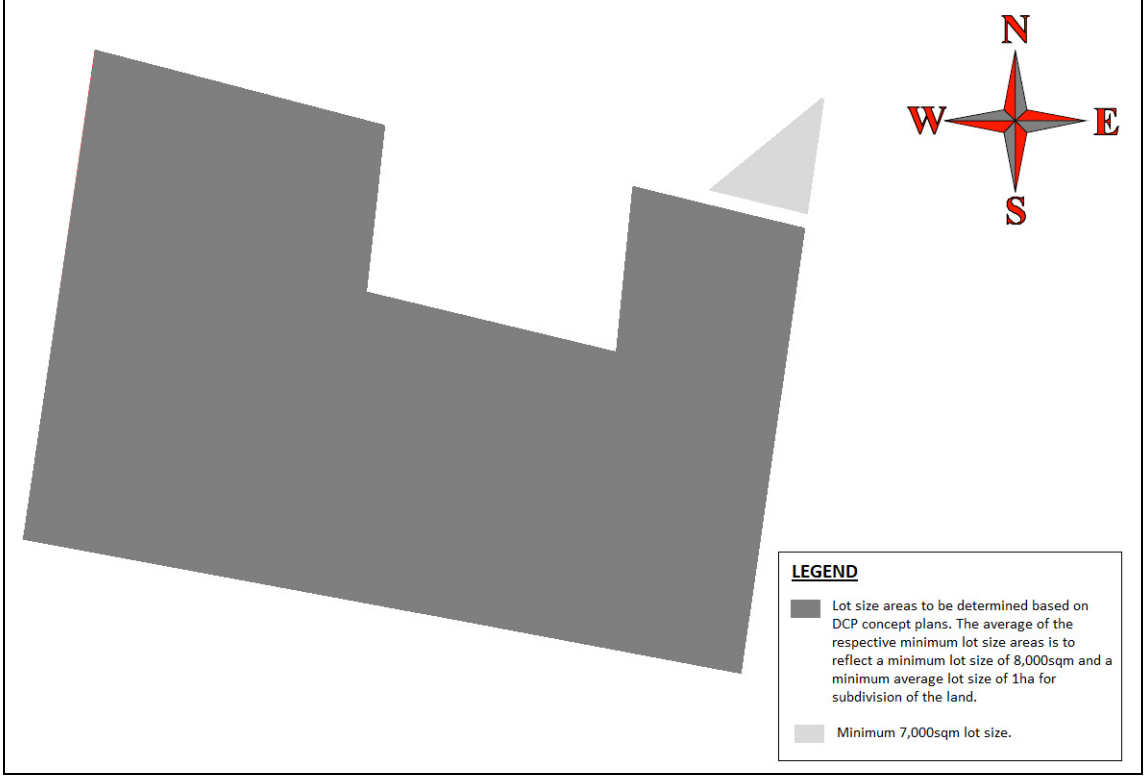
To achieve consistency with the provisions of the Singleton Land Use Strategy (2008), the total of the absolute minimum lot size areas should achieve an average of 1ha or greater.

It is intended to apply a minimum lot size of 7,000m^2 to subdivision of the triangular section of Lot 404, DP866648 that is north of Rusty Lane. This is to provide for the allotment to be excised off of the Branxton North East Candidate Area. Absolute minimum lot size areas for the rest of the site are to be greater than 8,000m^2. The aggregate of these minimum lot size areas should achieve an average of 1ha.

The draft Lot Size Map is intended to be prepared once a proposal to amend the Singleton Development Control Plan has been drafted which incorporates a concept subdivision layout for the site.

The road alignment and lot boundaries of the concept subdivision layout will be used as a basis for locating the boundaries of the minimum lot size areas for the LEP Lot Size Map. The plan which follows provides the context for preparation of the Lot Size Map.

Concept for Allocation of Minimum Lot Size Areas



The proposed 1ha lot size average promotes location of smaller lots in cleared areas of the site and placement of larger lot sizes in areas comprising significant vegetation. This minimizes segregation of vegetated areas. The averaging requirement also reduces the cumulative impacts of onsite septic disposal, which addresses a concern which was raised by the Department of Environment and Conservation during the preparation of the Rural Residential Development Strategy (which informed the SLUS).

Preparation of Development Control Plan

Development Control Plan (DCP) provisions are intended to be required to be prepared for the site. The provisions would be integrated into the Singleton Development Control Plan as an amendment.

The development control plan must, to the satisfaction of the Council:

(a) contain a staging and layout plan that makes provision for necessary infrastructure and sequencing and includes a detailed water servicing plan, to ensure that development occurs in a timely and efficient manner; and

(b) contain provisions to conserve, enhance and encourage the regeneration of areas of native vegetation with significant biodiversity value (including riparian corridors); and

(c) provide for an overall movement hierarchy showing the major circulation routes and connections to achieve a simple and safe movement system for private vehicles and public transport; and

(d) provide for amelioration of natural and environmental hazards, including bushfire, flooding, landslip and erosion, and potential site contamination, and

(e) contain measures to conserve any identified heritage; and

(f) contain stormwater and water quality management controls; and

(g) contain detailed design controls for any significant development sites.

Amendment under the new Standard Instrument Local Environmental Plan

Description

Implementation of this planning proposal as an amendment to the SI LEP would involve:

- Utilization of the "R5 Large Lot Residential zone" for the site; and
- Creation of a zoning plan and lot size map for the site; and
- A requirement for development control plan provisions to be prepared for the site.

Zoning

In consideration of the proposed lot sizes, large areas of cleared land and adjacent rural-residential land, the *R5 Large Lot Residential zone* is considered to be appropriate for the site. The R5 zone provides for rural-residential development in appropriate locations, taking into account natural constraints.

The zoning plan would need to be prepared in accordance with the Department of Planning and Infrastructure's Mapping Standards and Requirements for SI LEPs.

Objectives

The objectives for the R5 Large Lot Residential zone under the Standard Instrument will be adopted. These are:

(a) To provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality.

(b) To ensure that large residential allotments do not hinder the proper and orderly development of urban areas in the future.

(c) To ensure that development in the area does not unreasonably increase the demand for public services or public facilities.

(d) To minimise conflict between land uses within the zone and land uses within adjoining zones.

Definitions

Definitions are to be in accordance with the SI definitions.

Minimum Lot Size

Lot size provisions are to be implemented using a Lot Size Map in the SI LEP.

Local Provisions

Development Control Plan (DCP) provisions are intended to be required to be prepared for the site. The provisions would be integrated into the Singleton Development Control Plan as an amendment.

The DCP amendment must, to the satisfaction of the Council:

(a) contain a staging and layout plan that makes provision for necessary infrastructure and sequencing, and that includes a detailed water servicing plan, to ensure that development occurs in a timely and efficient manner, and

(b) contain provisions to conserve, enhance and encourage the regeneration of areas of native vegetation with significant biodiversity value (including riparian corridors), and

(c) provide for an overall movement hierarchy showing the major circulation routes and connections to achieve a simple and safe movement system for private vehicles and public transport, and

(d) provide for amelioration of natural and environmental hazards, including bushfire, flooding, landslip and erosion, and potential site contamination, and

(e) contain measures to conserve any identified heritage.

(f) contain stormwater and water quality management controls, and

(g) contain detailed design controls for any significant development sites.

The concept subdivision layout of the draft DCP could be used as a basis for preparation of the SI LEP minimum lot size map. The design of the concept subdivision and minimum lot size map should be such as to minimize the need for vegetation removal.

PART 4 – JUSTIFICATION FOR OBJECTIVES, OUTCOMES, PROVISIONS AND IMPLEMENTATION PROCESS

Need for the Planning Proposal

Is the planning proposal a result of any strategic study or report?

The land subject of this planning proposal is identified by the SLUS (**Attachment 1**) as having the potential to be rezoned to a rural-residential zoning. The site comprises the whole of the Branxton North East Candidate Area. The SLUS indicates that a minimum lot size of 2,000m^2 and a minimum average lot size of 4,000m^2 could have been suitable for the site if it were serviced with reticulated water and sewer.

Based on the information lodged by the proponent for this planning proposal, servicing of the site with sewer is unlikely to be economically feasible given the projected lot yield, development costs, and costs associated with infrastructure servicing. The proponent has therefore sought a minimum lot size of 8,000m^2 and a minimum average lot size of 1ha for subdivision of the land. It is intended to service such lots with reticulated water, but not sewer.

The SLUS projects a potential lot yield of 87 lots from the site, based on the 2,000m^2 minimum and 4,000m^2 minimum average lot sizes. The subdivision controls sought by this planning proposal are expected to reduce the potential lot yield from 87 lots to approximately 35 lots, which is a reduction of 52 lots.

The change in lot size provisions is considered to be appropriate due to the sites topographical constraints, servicing constraints and distance separation from the New England Highway (major transport corridor). Increases in potential yields from other candidate areas as a result of improved servicing availability will help off-set the reduction in potential lot yield from the subject site.

Is the planning proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

Placing land use and minimum lot size provisions for subdivision in Council's LEP, in conjunction with appropriate design controls in Council's DCP; is considered to be the most appropriate method for managing subdivision and land use in the locality. This method is supported by the adopted SLUS (2008) and is consistent with the method of managing land use for similar proposals in the Singleton LGA.

Is there a net community benefit?

The proposal will benefit the community by providing rural-residential allotments to meet projected demand for such allotments. The SLUS (Council's strategic document for land use planning) identifies the site as having good potential for rural-residential development.

The SLUS uses statistics on historical population growth and historical dwelling demand to project future population growth and demand for new dwellings. This data formed the basis for determining how much land would need to be rezoned to provide for the future population of Singleton LGA.

An analysis of the constraints and opportunities of potential suitable land was then undertaken to confirm suitable locations for rural-residential development. This analysis determined the suitability of the rural-residential candidate areas outlined in section 7 of the SLUS. The site subject of this planning proposal is located within the Branxton North East Candidate Area.

The proposal will rezone the subject land and provide for rural-residential subdivision to help meet the identified demand for rural-residential blocks for dwelling-house development. This planning proposal is not expected to create an unfavorable precedent or change the expectations of the landowner(s). The proposal will not result in a loss of employment lands.

The site is located on the fringe of the existing Branxton rural-residential area. The main transport corridor in the vicinity of the site is the New England Highway. The site has access to reticulated water supply infrastructure and is not proposed to be serviced by sewer. Some road upgrades may be required to provide for the additional traffic generated by the development. The costs associated with infrastructure provision are not considered to be cost prohibitive to development of the site. Given the rural-residential nature of the area, pedestrian paths and cycleways are not intended to be provided as part of the development of the site.

The Development Control Plan (DCP) provisions required by the proposed LEP are intended to contain requirements to conserve, enhance and encourage the regeneration of the native vegetation on the site. Areas of the site may be subject to localized flooding impacts from the natural watercourses during heavy storm periods. DCP provisions are to address such impacts. Overall, the proposal is considered to generate benefits to the community.

Relationship to Strategic Planning Framework

Is the planning proposal consistent with the objectives and actions contained within the applicable regional or sub-regional strategy (including the Sydney Metropolitan Strategy and exhibited draft strategies)?

The land subject of this planning proposal is not within a regional strategy endorsed by the NSW Department of Planning and Infrastructure.

Is the planning proposal consistent with the local Council's Community Strategic Plan, or other local strategic plan?

Council does not have a Community Strategic Plan. This planning proposal is however, consistent with Council's Management Plan 2011/12 – 2014/15. Processing of this planning proposal and the DCP amendment proposal will involve community consultation. The associated development controls and standards will help manage potential environmental impacts associated with development of the land.

The proposal does not conflict with the recommendations of the SLUS. The land subject of this planning proposal is identified in the SLUS as having potential for rezoning for rural-residential development.

Is the planning proposal consistent with applicable state environmental planning policies?

No State Environmental Planning Policies are identified as impacting upon the planning proposal. The site is not identified as being potential koala habitat; therefore *State Environmental Planning Policy No. 44 – Koala Habitat Protection* does not apply.

Is the proposal consistent with applicable Ministerial Directions (s.117 directions)?

The table which follows contains a response to each of the s117 directions in relation to the planning proposal.

Compliance with Section 117 Directions	
Direction	**Response**
1.1. Business and Industrial Zones	This direction is not applicable to the planning proposal.
1.2. Rural Zones	Rezoning of the land for rural-residential development is supported by the Singleton Land Use Strategy (SLUS). The candidate areas for rural-residential development which have been identified by the strategy are the result of a constraints analysis which considered the need to protect agricultural land of high production value.
1.3. Mining, Petroleum Production and Extractive Industries	This direction is not relevant to the planning proposal. The Branxton North East Candidate Area is identified by the SLUS as being potentially suitable for rezoning to a rural-residential land use zoning. The SLUS candidate areas were identified in consultation with public authorities inclusive of the Department of Primary Industries. The proposal would not have the effect of prohibiting the mining of coal or other minerals, production of petroleum, or winning or obtaining of extractive materials. The proposal is not viewed to restrict the potential development of resources of coal, other minerals, petroleum or extractive materials which are of State or regional significance.
1.4. Oyster Aquaculture	This direction is not applicable to the planning proposal.
1.5. Rural Lands	This planning proposal will change rural zoned land to a rural residential zone. It will also reduce the minimum lot size for subdivision of the land. Rezoning of the land to a rural-residential land use zoning is justified by the Singleton Land Use Strategy (SLUS). The candidate areas for rural-residential development that have been identified by the strategy are the result of a constraints analysis which considered the need to protect agricultural land of high production value.
2.1. Environment Protection Zones	The land subject of this planning proposal is not zoned for environmental protection purposes and is not intended to be rezoned

	to an environmental protection zone. The allotments subject of this planning proposal comprise large areas of cleared grassland and vegetation which have been subject to varying degrees of disturbance. The proposal endeavors to achieve a maintained/improved biodiversity outcome for the site through the proposed Development Control Plan (DCP) provisions.
2.2. Coastal Protection	This direction is not applicable to the planning proposal.
2.3. Heritage Conservation	No sites or items of European Heritage have been identified on the land subject of this planning proposal. The proponent has lodged an Archeological Assessment report which was prepared in 1997 for another proposal on the subject site. The study does not appear to comply with current requirements for preparing Aboriginal Cultural Heritage Assessment reports and as such, it is recommended that a new study be prepared for the site in accordance with current requirements. This planning proposal recommends that the LEP comprise a provision detailing that the required DCP must contain measures to conserve any identified heritage.
2.4. Recreation Vehicle Areas	This direction is not relevant to the planning proposal.
3.1. Residential Zones	This direction is not relevant to the planning proposal.
3.2. Caravan Parks and Manufactured Home Estates	This direction is not relevant to the planning proposal.
3.3. Home Occupations	The equivalent definition for "***home occupation***" in the Singleton LEP 1996 is "***home activity***". Home activities are exempt from requiring development consent in the proposed 1(d) (Rural Small Holdings zone). If the amendment occurs to Council's proposed Standard Instrument (SI) LEP, the amendment would need to comply with the mandatory provisions of the SI LEP template. The SI makes home occupations exempt from requiring development consent in the R5 (Large Lot Residential zone). The planning proposal is considered to be consistent with this direction.
3.4. Integrating Land Use and Transport	Rezoning of the site to a rural-residential land use zoning is justified by the Singleton Land Use Strategy (SLUS), which considers integration of transport and land uses. The SLUS has been endorsed by NSW Planning. Given the rural-residential nature of the proposal, proposed infrastructure requirements and the location of the site in

	relation to transport links; the proposal is considered to be appropriate.
3.5. Development Near Licensed Aerodromes	This direction is not relevant to the planning proposal.
4.1. Acid Sulphate Soils	This direction is not relevant to the planning proposal. The Singleton LGA is not mapped by the Acid Sulphate Soils Planning Maps held by the NSW Planning.
4.2. Mine Subsidence and Unstable Land	This direction is not applicable to the planning proposal. The sites are not within a Designated Mine Subsidence district and have not been identified as being unstable land.
4.3. Flood Prone Land	This direction is not relevant to the planning proposal. The site is not identified as being "Flood Prone Land" as defined by the *Floodplain Development Manual 2005*.
4.4. Planning for Bushfire Protection	The land subject of this planning proposal is mapped as being bushfire prone land on Council's bushfire prone land mapping. A large proportion of the land is cleared of significant vegetation. The site is capable of providing for rural-residential development that complies with *Planning for Bushfire Protection 2006*. Bushfire hazard reduction is not intended to be prohibited as part of this planning proposal. The development control plan (DCP) provisions which are intended to be required by the LEP, require the DCP to contain provisions which provide for amelioration of natural and environmental hazards, including bushfire. Ultimately, the *Rural Fires Act 1997*, *Rural Fires Regulation 2008* and *Planning for Bushfire Protection 2006* will comprise the most applicable provisions regarding bushfire risk management.
5.1. Implementation of Regional Strategies	This direction is not applicable to the planning proposal.
5.2. Sydney Drinking Water Catchments	This direction is not applicable to the planning proposal.
5.3. Farmland of State and Regional Significance on the NSW Far North Coast	This direction is not applicable to the planning proposal.
5.4. Commercial and Retail Development along the Pacific Highway, North Coast	This direction is not applicable to the planning proposal.
5.5. Development in the vicinity of Ellalong, Paxton and Millfield (Cessnock LGA)	This direction has been revoked and is not applicable to the planning proposal.
5.6. Sydney to Canberra Corridor	This direction has been revoked and is not

	applicable to the planning proposal.
5.7. Central Coast	This direction has been revoked and is not applicable to the planning proposal.
5.8. Second Sydney Airport: Badgerys Creek	This direction is not applicable to the planning proposal.
6.1. Approval and Referral Requirements	This planning proposal does not include provisions that require the concurrence, consultation or referral of development applications to a minister or public authority and does not identify development as designated development.
6.2. Reserving Land for Public Purposes	This direction is not relevant to the planning proposal.
6.3. Site Specific Provisions	This direction is not relevant to the planning proposal. The proposal does not intend to amend another environmental planning instrument in order to allow a particular development proposal to be carried out.
7.1. Implementation of the Metropolitan Strategy	This direction is not applicable to the planning proposal.

Environmental, Social and Economic Impact

Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

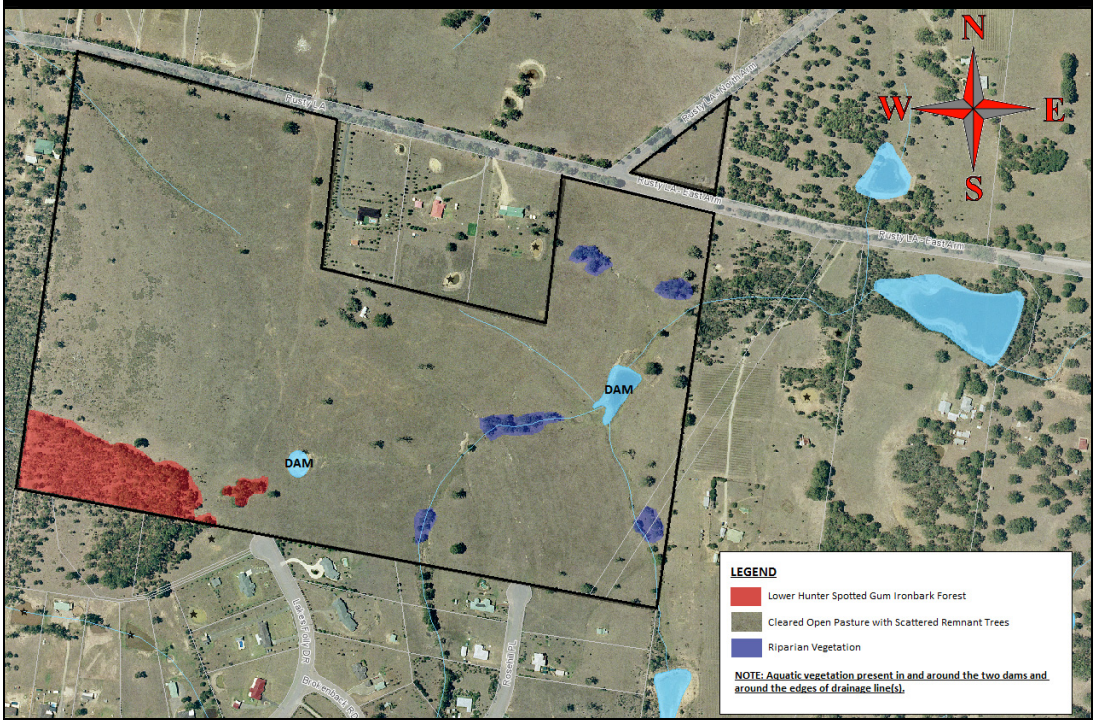
The proponent has lodged an ecological constraints study for the proposal. The study and recommendations focus on subdivision of the land to create lots with a minimum lot size of 2,000m^2 and a minimum average lot size of 4,000m^2. These lot size provisions are inconsistent with the recommendations of this planning proposal. For the purposes of clarity during exhibition and public authority consultation, an updated report is required to be submitted, which reflects the subject planning proposal.

The report should also incorporate a Biodiversity Impact Assessment, which demonstrates compliance with the Environmental Outcomes Assessment Methodology of the *Native Vegetation Regulation 2005*.

The report which has been lodged indicates that the site comprises four main vegetation assemblages, being:

- Cleared Open Pasture with scattered remnant trees;
- Spotted Gum – Ironbark Woodland;
- Riparian Vegetation; and
- Aquatic Vegetation.

Flora Assemblages



The south-west corner of the property comprises an area of Lower Hunter Spotted Gum Ironbark Forest, which provides connectivity to substantial vegetation west of the site.

The site is dissected by intermittent watercourses/drainage gullies. Some vegetation exists along the riparian corridors of these watercourses/drainage gullies. Aquatic vegetation is present around the two farm dams on the site and in drainage gullies. The rest of the site comprises cleared open pasture with scattered remnant trees.

Threatened Flora Species

The ecological constraints study details that no threatened flora species have been identified on the site. Habitat was, however, found to be available on the site for the following threatened species:

- *Eucalyptus glaucina* – Slatey Red Gum;
- *Eucalyptus parramattensis ssp. Decadens* – Drooping Red Gum;
- *Grevillea parvifolia ssp. Parviflora* - Grevillea;
- *Acacia bynoeana* – Bynoe's Wattle;
- *Rutidosis heterogama* - Wrinclewort; and
- *Persoonia pauciflora* – North Rothbury Persoonia.

Grevillia Montana, which is considered to be a rare species, has been identified within the remnant Lower Hunter Spotted Gum – Ironbark – Grey Box forest that exists within the southwest corner of the site.

Separate from those flora species considered to be threatened or rare, the following flora species, considered to be of regional significance, were also identified on the site:

- *Acacia folcata;*
- *Goodenia rotundifolia; and*
- *Imperata cylindrical var. major.*

Threatened Fauna Species

One threatened fauna species, being the *Pomoatostomus temporalis temporalis* (Grey-crowned Babbler), was recorded within the site during the survey. A family group of up to 10 individuals were observed in a remnant tree in the north-west of the site.

Separate from the Grey-crowned Babbler, the report detailed that there was considered to be habitat available on the site for the following threatened fauna species:

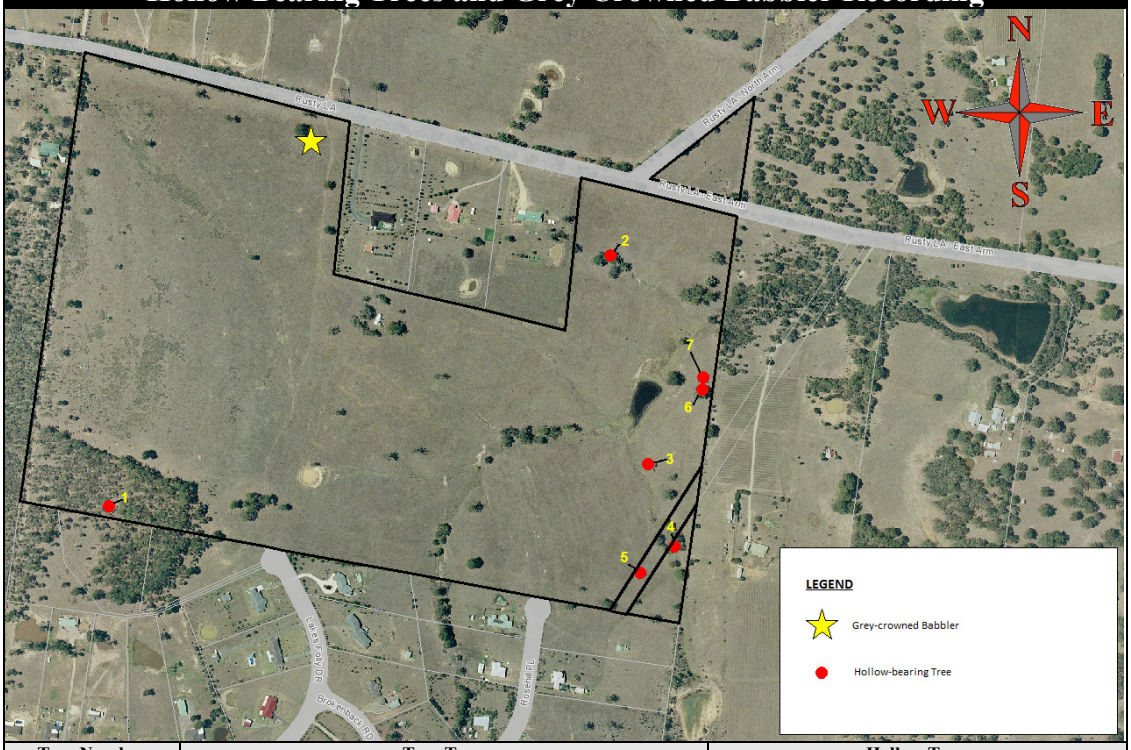
- *Litoria aurea* - Green and Gold Bell Frog;
- *Ephippiorhynchus asiaticus* - Black-necked Stork;
- *Rostratula benghalensis australis* - Australian Painted Snipe;
- *Calyptorhynchus lathami* - Glossy Black Cockatoo;
- *Lathamus discolor* - Swift Parrot;
- *Neophema pulchella* - Turquoise Parrot;
- *Climacteris picumnus victoriae* - Brown Treecreeper;
- *Pyrrholaemus sagittatus* - Speckled Warbler;
- *Xanthomyza phrygia* - Regent Honeyeater;
- *Melithreptus gularis gularis* - Black-chinned Honeyeater;
- *Grantiella picta* - Painted Honeyeater;
- *Lophoictinia isura* - Square-tailed Kite;
- *Ninox connivens* - Barking Owl;
- *Ninox strenua* - Powerful Owl;
- *Tyto novaehollandiae* - Masked Owl;
- *Phascogale tapoatafa* - Brush-Tailed Phascogale;
- *Pteropus poliocephalus* - Grey-headed Flying-Fox;
- *Falsistrellus tasmaniensis* - Eastern Falsistrelle;
- *Chalinolobus dwyeri* - Large Pied Bat;
- *Miniopterus australis* - Little Bentwing-bat;
- *Miniopterus schreibersii oceanensis* - Large Bentwing-bat;
- *Myotis adversus* - Large Footed Myotis;
- *Scoteanax rueppellii* - Greater Broad-nosed Bat; and
- *Vespadelus troughtonii* - Eastern Cave Bat.

Seven hollow bearing trees were identified within the site. The classification system employed involved three classes:

- **Class 1** – large sized hollow openings (i.e. >15cm) suitable for species such as Owls

- **Class 2** – medium sized hollow-openings (i.e. 5-15cm) suitable for species such as Gliders and Possums
- **Class 3** – small sized hollow openings (i.e. <5cm) suitable for species such as microchiropteran bats.

Hollow Bearing Trees and Grey Crowned Babbler Recording



Tree Number	Tree Type	Hollow Type
1	*Eucalyptus crebra* (Narrow-leaved Ironbark)	1 x Class 3 (Probable)
2	*Angophora floribunda* (Rough-barked Apple)	1 x Class 3
3	*E. crebra*	1 x Class 2 1 x Class 3
4	*Eucalyptus tereticornis* (Forest Red Gum)	1 x Class 3
5	*E. crebra* - Tree half dead	1 x Class 3
6	*E. crebra* - Large Tree - Large hollow 4 metres off ground.	1 x Class 1 - Large hollow 4 metres off ground. 1 x Class 2 1 x Class 3
7	*E. crebra* - Damaged at base openings in the form of cracks	1 x Class 3

Endangered Ecological Communities

The southwest corner of the site comprises approximately 2 hectares of Spotted Gum-Ironbark Woodland which could be considered to be remnant Lower Hunter Spotted Gum – Ironbark – Grey Box forest, given the presence of particular species that are characteristic of the assemblage of the community. A smaller isolated remnant approximately 0.1ha in area was also present nearby to the east.

The Lower Hunter Spotted Gum – Ironbark – Grey Box forest is listed as being an endangered ecological community in Part 3 of Schedule 1 of the *Threatened Species Conservation Act 1995*.

The site also comprises highly disturbed riparian vegetation along drainage lines which has been identified as comprising remnants of Hunter Redgum Forest and Central Hunter Swamp Oak Forest which are endangered ecological communities listed in Part 3 of Schedule 1 of *the Threatened Species Conservation Act 1995*.

The ecological constraints study which has been submitted recommends retention of the area of remnant Lower Hunter Spotted Gum – Ironbark – Grey Box forest in the south-west corner of the site and the riparian vegetation along the watercourses dissecting the site. Providing that these areas of vegetation are protected, development of the site, as a result of rezoning, should not generate significant adverse impacts in regard to critical habitat, threatened species, populations or ecological communities, or their habitats.

Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be managed?

The proposal is not expected to generate any significant adverse environmental impacts. The proposed averaging of lot sizes helps minimize the cumulative impacts of onsite effluent disposal. The proposed DCP provisions help minimize impacts on flora, fauna and biodiversity as well as hazard impacts and stormwater quality issues.

How has the planning proposal adequately addressed any social and economic effects?

The planning proposal is not expected to generate any significant adverse social or economic impacts. The proposal forms a logical extension to the existing rural residential area. The proposed low density would provide for sufficient distancing of development from neighboring properties. No significant adverse economic impacts have been identified as likely to result due to the proposal.

State and Commonwealth Interests

Is there adequate public infrastructure for the planning proposal?

The site subject of this planning proposal has adequate access to electricity, telecommunications, road and reticulated water supply infrastructure.

The Hunter water Corporation has advised that the closest point of connection for sewer is Access Chamber H193 in McMullins Road - halfway between Hillview Road and George Street (approximately 3kms away via road). Substantial infrastructure would be required to be constructed to be able to service the site with sewer. The proponent has therefore put forward a proposal which provides for lower density un-sewered allotments.

Development Control Plan provisions and LEP minimum lot size requirements (achieving average lot size outcomes) provide for onsite effluent disposal (septic). Some infrastructure upgrades will be required to provide for the proposal, however such upgrades are not considered to make the proposal uneconomical.

What are the views of State and Commonwealth public authorities consulted in accordance with the gateway determination?

A response to this section will be provided following the gateway determination and public authority consultation required by the gateway response.

PART 5 – PROPOSED COMMUNITY CONSULTATION

Approval from the Director-General

At the time of preparation of this planning proposal, approval had not been received from the Director-General of the NSW Department of Planning and Infrastructure to carry out community consultation. Such approval is expected to be issued as part of the gateway determination. This section is proposed to be revised subsequent to the gateway response.

Community Consultation

A response to this section will be provided following the gateway determination. The gateway response is to advise of the planning proposal type and required exhibition period.

PART 6 – CONCLUSION AND RECOMMENDATION

The planning proposal is consistent with Council's strategic planning framework and the Department of Planning and Infrastructure's: "*A guide to preparing planning proposals*".

The proposed LEP amendment would make land available for rural residential development. The proposed development control plan (DCP) provisions encourage positive environmental and design outcomes.

It is recommended for this planning proposal to be supported and processed in accordance with the Gateway LEP making process.

Appendix 1 – Singleton Land Use Strategy

SINGLETON
LAND USE STRATEGY

SINGLETON COUNCIL

Adopted by Council: 21 April 2008

Endorsed by Department of Planning: 8 June 2008

SINGLETON
LAND USE STRATEGY

PREPARED FOR

SINGLETON COUNCIL

The Singleton Land Use Strategy (April 2008) has been prepared for Singleton Council by Planning Workshop Australia, in association with Land and Environment Planning.

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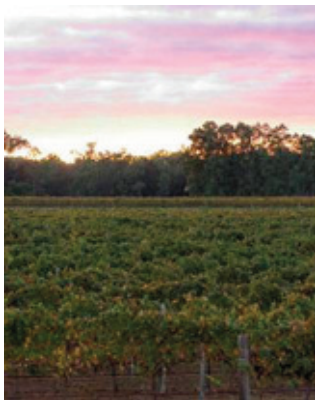


1 INTRODUCTION

The Singleton Land Use Strategy has been prepared for Singleton Council.

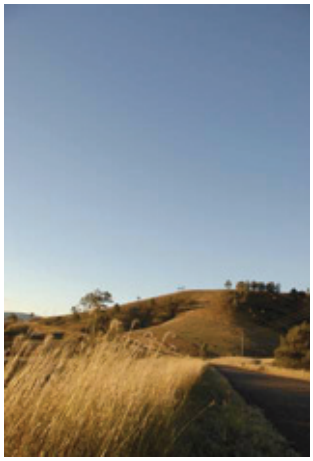
The Strategy outlines key land use policies and principles for the Singleton local government area (LGA), and provides the planning context for the preparation of local environmental plan provisions. The Strategy has a time frame of 25 years, to 2032. The area to which the Strategy applies is shown in Map 1.1.

The intent of the Strategy is to:

- Recommend actions for achieving the land use objectives of the Singleton community, consistent with the Council vision.
- Recommend changes to Singleton Local Environmental Plan (LEP) 1996 to reflect the Singleton Council and community vision, the adopted 2030 Strategy, and the land use objectives, consistent with NSW Government planning requirements, including the Standard LEP provisions.

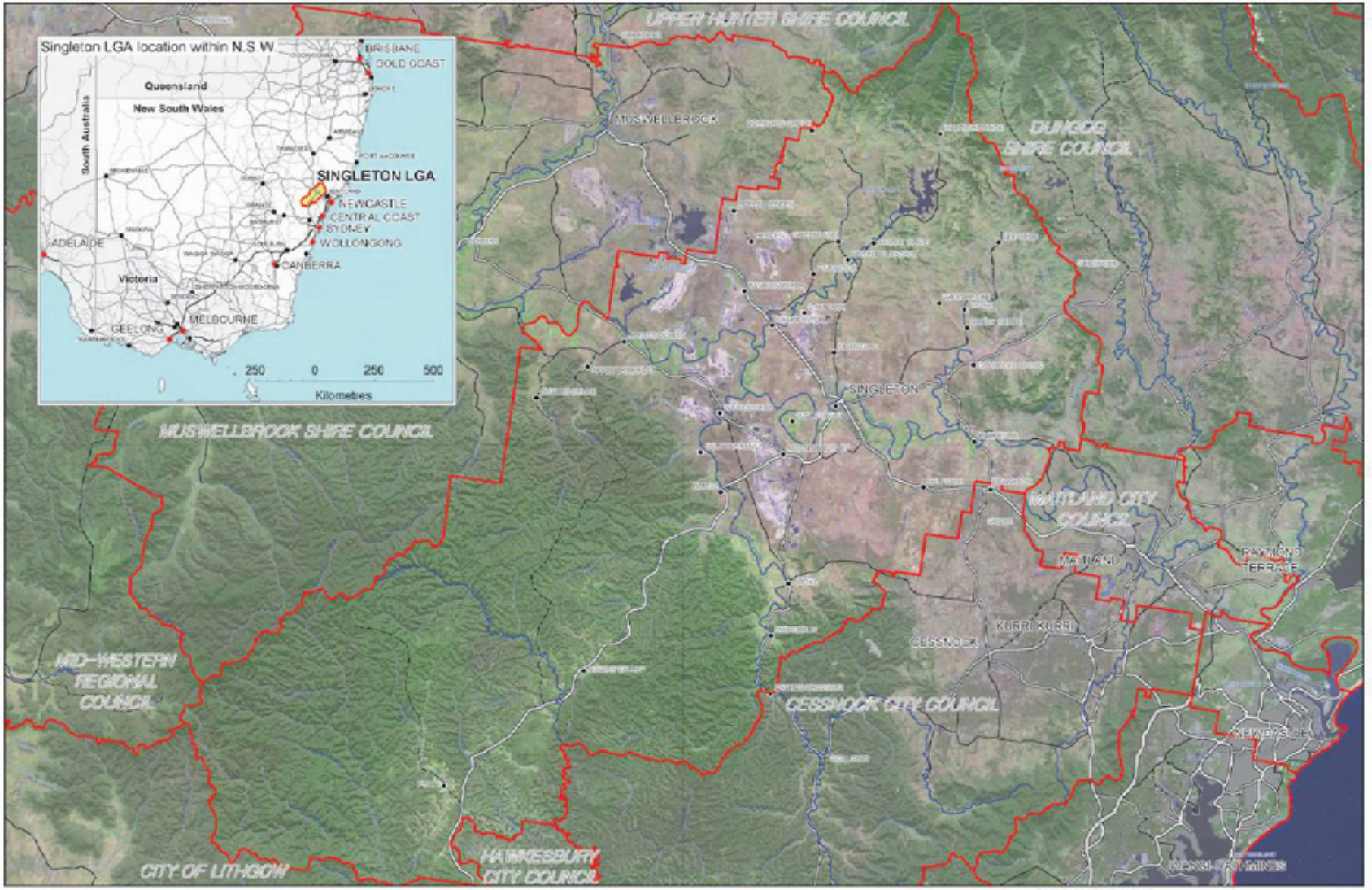
The Strategy identifies where growth and change is expected to occur, and land use planning objectives and strategies to guide this growth and change. It also identifies infrastructure requirements to support development, and will help inform local and state government budget processes.

The Strategy has been prepared with funding under the NSW Department of Planning's *Planning Reform Funding Program*. Preparation of the Strategy has been overseen by representatives from the Council and the Department, and has involved the following steps:



1. Review of the key planning issues
2. Consultation with Council and relevant NSW Government agencies
3. Preparation of a *Situation Analysis* report
4. Community consultation workshops
5. Preparation and public exhibition of the draft Strategy.

The Situation Analysis report provides a profile of Singleton LGA. It has established the key land use planning issues and strategic priorities and actions to be considered in the preparation of the Strategy and subsequent local environmental plan. A summary of the information in the Situation Analysis has been included in relevant sections of the Strategy.



Singleton Land Use Strategy

LOCATION MAP & TOPOGRAPHY

Source: Singleton Shire Council 2007

prepared by planning workshop australia

Fig 1.1

2 VISION

The Strategy aims to provide clear direction for Council and NSW Government agencies to guide decisions relating to future use of land within the Singleton LGA, and to inform the preparation of a comprehensive local environmental plan (providing regulatory land use controls). It establishes a policy framework to facilitate opportunities as they emerge in the future.

The proposed vision for the Strategy is 'to create a progressive community of excellence and sustainability'. This is based on the vision statement outlined in Singleton Council's Management Plan, and complements Council's adopted 2030 Strategy. The Strategy takes into account the objects of Section 5A of the *Environmental Planning and Assessment Act 1979* in identifying proposed actions to implement the vision. This legislation provides the legal framework for the preparation of local environmental plans.

3 STRUCTURE OF STRATEGY

The Strategy is based on the information and land use planning issues identified in the Situation Analysis and during the consultation process. Its priority is those issues that are within the scope of local environmental plan (LEP) provisions.

Key land use planning issues for the Strategy were identified in the Situation Analysis, and were classified according to whether they were mainly urban or rural issues, as follows:

URBAN ISSUES

- Catering for settlement needs
- Providing and maintaining urban infrastructure
- Reviewing development on highway frontage land
- Providing for industrial and commercial development
- Planning for risks and economic vulnerability to flooding
- Providing for social infrastructure and urban amenity

RURAL ISSUES

- Catering for rural residential subdivision and development
- Promoting agricultural development, protection of employment opportunities and the natural resource base
- Planning for rural servicing requirements (costs and maintenance)
- Planning for rural highway frontage development
- Identifying environmental values, constraints and protection requirements

The omission of reference to an issue does not mean that it has not been considered in the Strategy or is not of importance. While it may not be regarded as a key issue, it is likely to have been considered in conjunction with another issue.

The themes used in structuring the Strategy take into account the key land use planning issues, and are as follows:

- Urban settlement
- Villages and rural residential development
- Rural areas
- Environmental values and constraints.

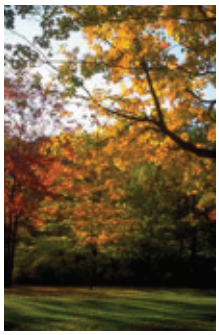
A summary of the present situation is presented for each theme, followed by background information on each issue and objectives that can be considered for the subsequent local environmental plan. This is followed by a policy indicating how the Council should respond to each issue in a consistent manner, and strategic actions which would direct future planning and identify implementation responsibilities. Further background detail on each of the planning issues and themes can be found in the accompanying Situation Analysis report.

4 PLANNING CONTEXT

This section summarises important attributes of the LGA, and key characteristics which will affect future land use. It includes information on what is important about the area, and an overview of existing strategies and land use planning provisions.

Information is provided for the whole LGA as well as for 11 planning areas which enable spatial differences to be identified. This information is based on the Situation Analysis report, and more detailed information is included in that report.

Singleton is a large LGA with an area of 4,896km^2, comprising about 16% of the Hunter Region. It had an estimated resident population of 23,258 persons on 30 June 2007 (around 3.5% of the regional population) and has shown a steady growth. The increase in population over the previous year was 253 persons, representing a growth rate of 1.1%.



Important characteristics of Singleton LGA in 2008 which will influence future land use are summarised in Table 1, focusing on demographic and economic factors. These show that Singleton is a relatively prosperous area with a diverse economic and natural resource base, and has a relatively young population.

Table 1: Important existing characteristics of Singleton LGA

Characteristic
Outside the urban areas the main land uses are agriculture, national parks, and coal mining
Prosperous economy and employment opportunities (high dependence on coal mining and metropolitan spillover)
Compared to the Hunter Region and NSW, population is relatively well off and a relatively young average age
Adequate urban water and sewer infrastructure, and provision adequate for maintenance (in existing service areas)
Over the last 20 years new housing development has occurred at about 160 dwellings per year, with about 40% in residential areas and balance rural/rural residential.
Locational and transport advantages through location on New England Highway and Main Northern Railway Line. Increasing traffic flows (mainly New England Highway, Singleton town, and areas SE and E of Singleton), and high level of commuting by car to work. Rural road infrastructure improvement and maintenance pressures
Potential new infrastructure provision (F3 Freeway extension, gas supply)
Relatively poor public transport accessibility

Characteristic
Decline and uncertainty in agricultural sector
Identification of important remnant native vegetation within LGA, including endangered ecological communities (e.g. floodplain vegetation, Lower Hunter Spotted Gum Ironbark Vegetation, Warkworth Sands, and Weeping Myall Woodland)
Uncertainty in relation to industrial land demand and supply (largely driven by Lower Hunter situation)
Limits on availability of water supplies at the regional level
Significant area of land in LGA subject to natural hazards (flooding and bush fires)

The distribution of population within the Singleton LGA is shown on Map 4.1, together with the planning areas used for demographic analysis in the Situation Analysis.

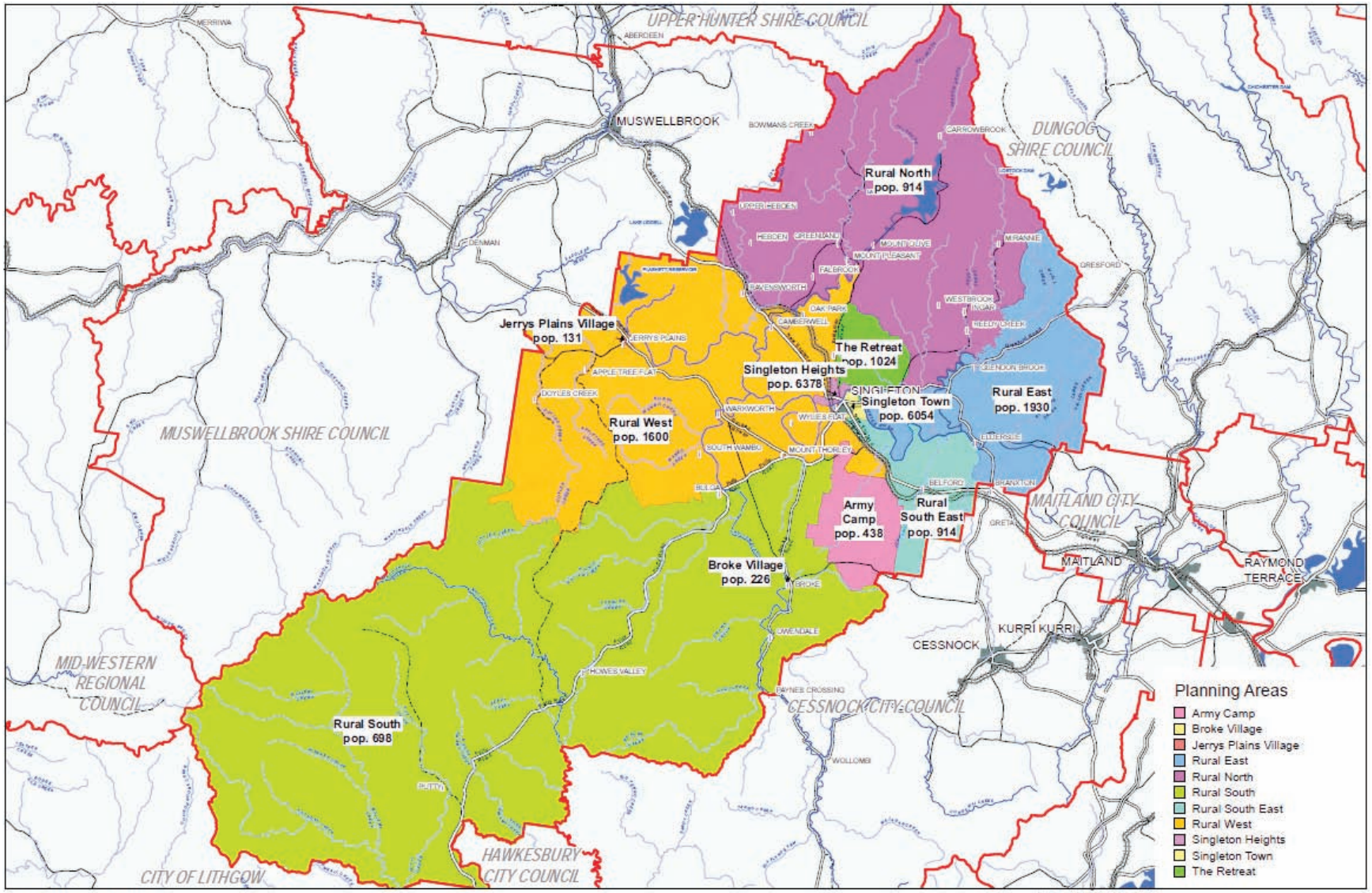
The planning areas have been used to differentiate between varying social, economic and land use characteristics occurring within the LGA. The boundaries of these planning areas are shown on Map 4.1, and are based on ABS Census Collection Districts amalgamated to group areas that have common characteristics. These planning areas correspond with those identified in the Singleton Community Social Plan, except that urban areas have been consolidated.

There are significant variations in the characteristics of each planning area, and land use issues vary between the areas as summarised in Table 2. Overall, in urban areas there is continuing pressure for urban development. Urban areas have accommodated about 50% of population growth over the last 10 years. Pressure for rural residential development is primarily within 20 km of Singleton and near Branxton, while more distant rural areas are stable.

Table 2: Singleton LGA planning areas and key land use issues

Planning area name	Description and key land use issues (e.g. growth expectations, land use constraints)
Urban	
Singleton Town	Focus of ageing population, flood liable land, commercial areas and consolidation of CBD, major transport and services, limited expansion potential, heritage issues, urban infill development, servicing and infrastructure issues (especially urban stormwater). Provision of industrial land.
Singleton Heights (North Singleton)	Relatively young population. Future urban growth will be concentrated in this area. Long term residential land opportunities need to be provided for and sites need to be identified for urban support uses (e.g. schools, health and social facilities).

Planning area name	Description and key land use issues (e.g. growth expectations, land use constraints)
	Consideration needs to be given to provision of retail areas and potential for additional industrial land. Transport accessibility is largely reliant on private transport, and there is limited accessibility to major transport links and Singleton Town.
	Villages, rural residential and other
Retreat	Relatively young, well off rural residential population. High car dependency. Increasing population requiring services. Some demand for additional rural residential development.
Broke Village	Reticulated water supply soon available. Lack of reticulated sewer limits development potential. Some flood liable land. Potential for mining impacts.
Jerrys Plains Village	Stable or slightly declining population with low urban growth, limited facilities and services. Potential land available for further urban development, but little land use change expected. Heritage issues for infill development. Potential coal mining in the vicinity.
Army Camp	Commonwealth land outside Council control.
	Rural
Rural North	Most stable planning area in LGA in terms of agriculture, land use and population change. Includes most important grazing enterprises and largest rural landholding sizes.
Rural East	Greatest pressure for rural residential development and small rural subdivision.
Rural South East	Pressure for more rural and rural residential development due to accessibility to Maitland, Cessnock and Greater Sydney Metropolitan area. Limited water availability. Lower Hunter Regional Strategy identifies potential for urban development in part of this area.
Rural South	Many absentee landowners due to accessibility to Greater Sydney Metropolitan area. Pressure for more rural and rural residential subdivision. Some mining impacts. High bush fire hazards on land in vicinity of Wollemi and Yengo National Parks.
Rural West	Stable population, with considerable open cut mining activity and associated land use change and environmental impact. A large proportion of the area is in mining ownership. Includes areas of Wollemi National Park.



Singleton Land Use Strategy

PLANNING AREAS & POPULATION DISTRIBUTION (2006)

Fig 4.1

Projected or anticipated changes, trends or pressures for the next 15 years which should be taken into account are summarised as follows:

- Pressure for extension to existing urban infrastructure (especially water service areas)
- Continuing coal mining production, and rehabilitation of coal mining areas with potential for subsequent post mining uses
- Increasing urban development pressure (including rural residential) around Branxton and near areas with transport accessibility and services (Singleton)
- Increasing pressure for improved public transport and accessibility to Newcastle for services
- Continuing population growth, with further ageing of population
- Increasing inadequacy of housing suited to ageing of population and reduced number of persons per dwelling (possible mismatch in housing supply and demand)
- Pressure for increasing intensive agriculture and consolidation of agricultural holdings (where this has not been prevented by subdivision and development)
- Increasing cost pressures for services (provision of roads and service infrastructure in rural/rural residential areas, transport costs) leading to less commuting
- Increasing demand for maintaining environment and amenity and 'tree change' lifestyle
- Reduced population 0 – 24 years, requiring fewer services and measures to maintain population and skills
- Requirement to improve landscape connectivity for biodiversity and maintain native vegetation (increased pressure from non-native species)
- Climate change leading to more variability in climate and reduced water security

Key matters that will affect land use in the area are the ability to maintain viable economic activities; the ability to maintain an attractive lifestyle; and the ability to attract new residents to the region. This will primarily be affected by providing and maintaining high quality key infrastructure and reasonable cost of provision (transport, water, and urban), community services (especially education and health), and amenity (landscape and environment).

4.1 Growth trends

Singleton's growth scenario anticipated for the 25 years to 2032 is for a population increase in the range 1.0 – 1.5% per annum. This Strategy adopts a population growth forecast of 1.5% per annum, and forecasts new dwelling demand averaging 200 dwellings per year. Growth is expected to substantially result from in-migration for

lifestyle and employment reasons. Dwelling requirements are expected to grow faster than population growth, based on lower dwelling occupancy rate trends. A large proportion of the workforce is employed in the mining industry which is expected to maintain its employment level over the Strategy period.

The population in most areas of the Singleton LGA is expected to increase, but some parts of the area will grow more quickly, especially Singleton Heights/North Singleton and the Rural East Planning Area. The increasingly ageing population structure reflects regional and national trends and contributes to a reduction in the dwelling occupancy rate. This is expected to result in additional demand for housing. An increasing proportion of the population is expected to live in urban areas. New dwellings in rural areas are expected to decline from up to 70% of all dwellings (e.g. 2000 and 2001) to about 35% of all dwellings, largely as a result of a reduction in the supply of rural lots, adequate supply of residential lots in Singleton, and trends towards increasingly expensive transport costs. These estimates do not take into account demand and supply in the Branxton area, since no timing is available for land supply in this area, and it is unlikely that this would occur within 5 years.

4.2 Planning framework

The Singleton LGA's existing planning framework is outlined in the Situation Analysis. There is a single existing local environmental plan (Singleton LEP 1996) and a range of development control plans.

The current regional planning framework for Singleton LGA is provided by Hunter Regional Environmental Plan 1989. This outlines a range of land use objectives and principles at the regional scale.

The Lower Hunter Regional Strategy 2006, prepared by the NSW Department of Planning, provides a broad land use planning framework for the Lower Hunter Sub Region, focusing on projected land requirements for housing and employment generating development. This Strategy is a policy document which updates the strategy and population projections outlined in the Hunter Regional Environmental Plan 1989, but does not replace the objectives, strategies and statutory requirements of the Plan. Under a Section 117 direction, LEPs are required to be consistent with a regional strategy.

The Lower Hunter Regional Strategy has implications for the Singleton Land Use Strategy, as follows:

- Growth projections for the Lower Hunter sub region can be expected to affect parts of Singleton LGA because the area forms part of a larger regional housing market. Historical data has shown that Singleton is substantially aligned to Lower Hunter trends.
- It identifies additional urban expansion areas south of Branxton, including up to around 2000 lots in Singleton LGA as part of a new urban area having around 7000 lots, and a new overall potential population of 15-20,000 people. It indicates a national park proposal within Singleton LGA south west of Branxton, which forms part of a separate agreement between a private land owner and the NSW Government to allow urban development.

- It limits rural residential development within the Lower Hunter Region to existing zoned areas, potentially leading to greater demand for this type of development within Singleton LGA in the longer term.
- It identifies adequate medium to long term industrial land supply within the sub region, with large areas currently zoned industrial. This supply may reduce industrial land requirements elsewhere in the region, including Singleton.

This Strategy supports the implementation of a consistent planning framework for Singleton and has taken into account relevant State planning policies and directions under Section 117 of the *Environmental Planning and Assessment Act 1979*.

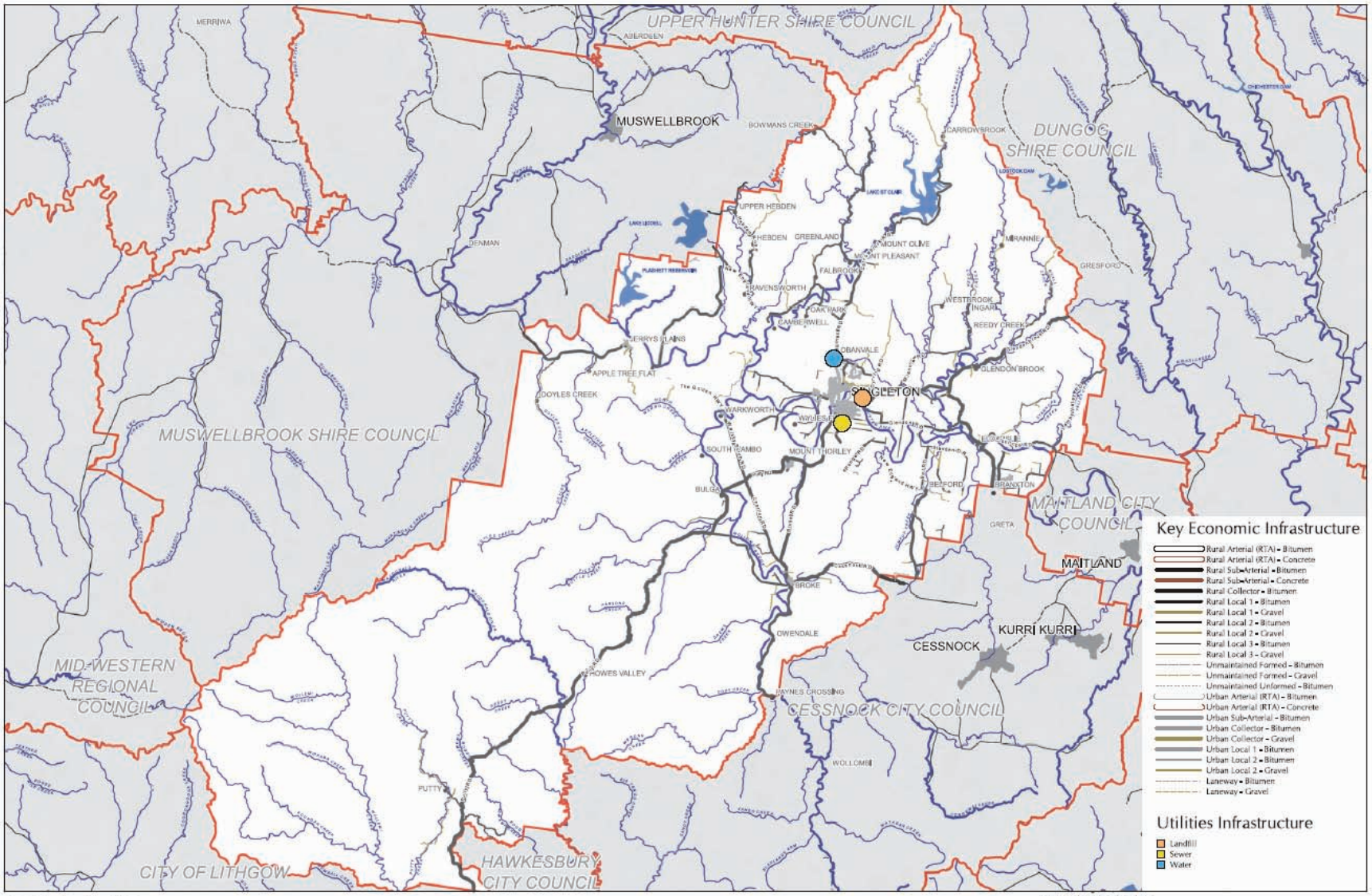
The format and content of the LEP resulting from the Strategy will be substantially determined by the NSW Government standard provisions for plans. Other specific agency requirements will also affect the LEP provisions.

4.3 Settlement structure and infrastructure

Major economic activities within the LGA are coal mining, agriculture, defence and tourism, in addition to urban support activities such as business and industrial land. Information on the characteristics, economic value and land use requirements of these activities are included in the Situation Analysis report. Background information on these and other infrastructure and settlement structure issues identified in the Situation Analysis, such as climate and infrastructure, is presented in the relevant sections of the Strategy.

Housing characteristics and availability are important for future land use and development. ABS Census data for 2006 shows a total of 8374 private dwellings within the Singleton LGA, with an average increase of around 160 per year over the last 25 years. About 9% of the dwellings were unoccupied, which is average for NSW, but lower than the Hunter Region average. In 2001, separate dwelling houses accounted for 80.5% of all dwellings and there were 0.38 dwellings per capita, which is lower than most LGAs in the Hunter Region. Shortages of rental accommodation have periodically occurred in Singleton, and there are potential issues associated with provision of affordable housing, and changes in housing requirements associated with the overall ageing of the population.

Singleton LGA is well accessed by roads and transport routes and is adequately serviced with infrastructure. The Situation Analysis report reviewed key infrastructure issues within the Singleton LGA, including water supply, sewer, transport, stormwater, waste management, bushfire facilities and open space. Summary information is presented in Maps 4.2 to 4.4 and Table 3.



Singleton Land Use Strategy

Source: Singleton Shire Council 2007

RURAL ROAD INFRASTRUCTURE & UTILITIES

prepared by planning workshop australia
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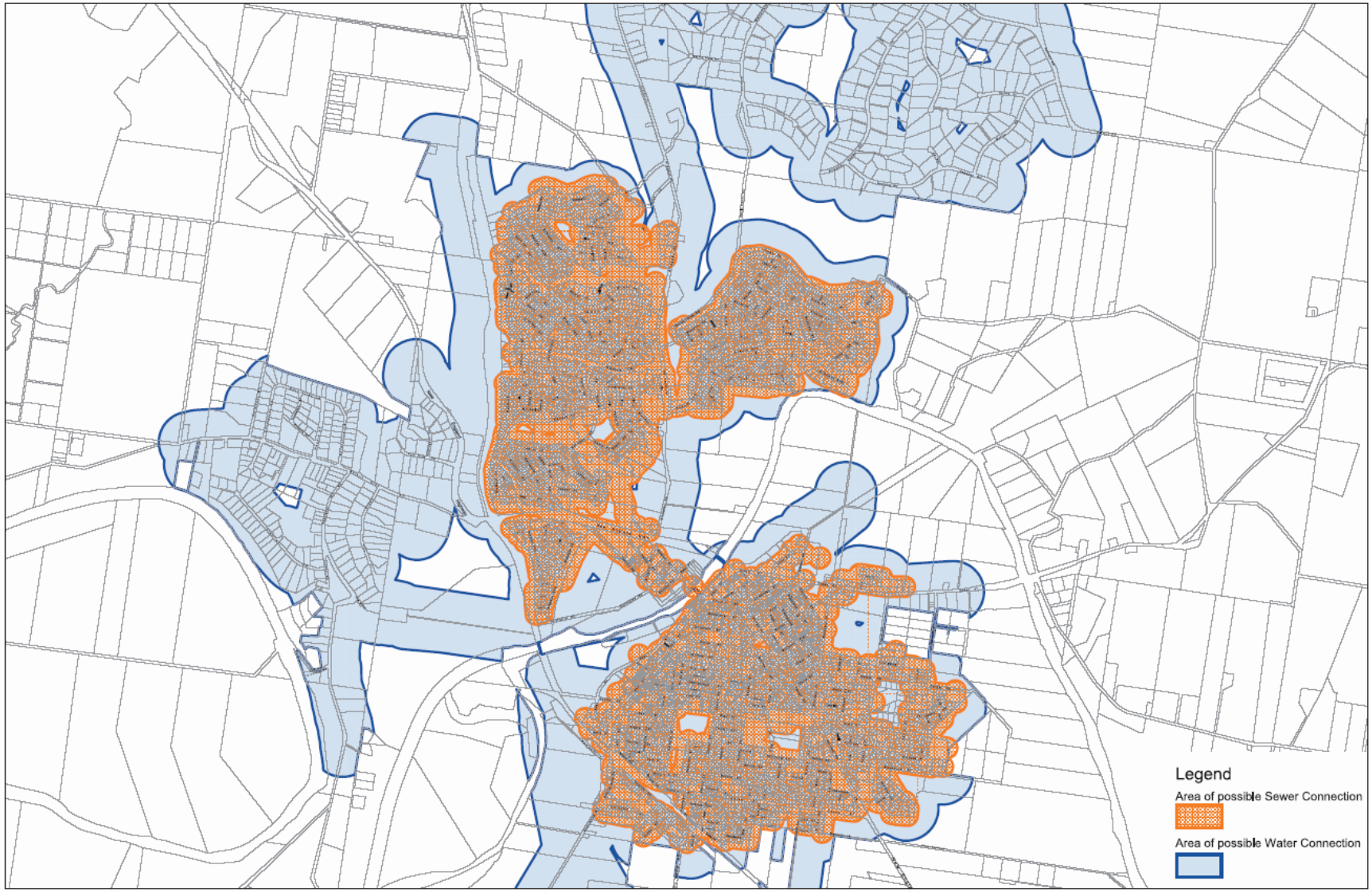
0 A3 is 1:400,000 10 km

Issued 11 June 07

Fig 4.2



Source: Singleton Shire Council 2007

Singleton Land Use Strategy

WATER AND SEWER SERVICE AREA - SINGLETON

prepared by planning workshop australia
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0 A3 is 1:25,000 1000 m

issued 11 June 07

Fig 4.3A

Singleton Land Use Strategy

WATER SERVICE AREA - JERRYS PLAINS

Fig 4.3B

Source: Singleton Shire Council 2007

Singleton Land Use Strategy

WATER SERVICE AREA - BROKE

prepared by planning workshop australia
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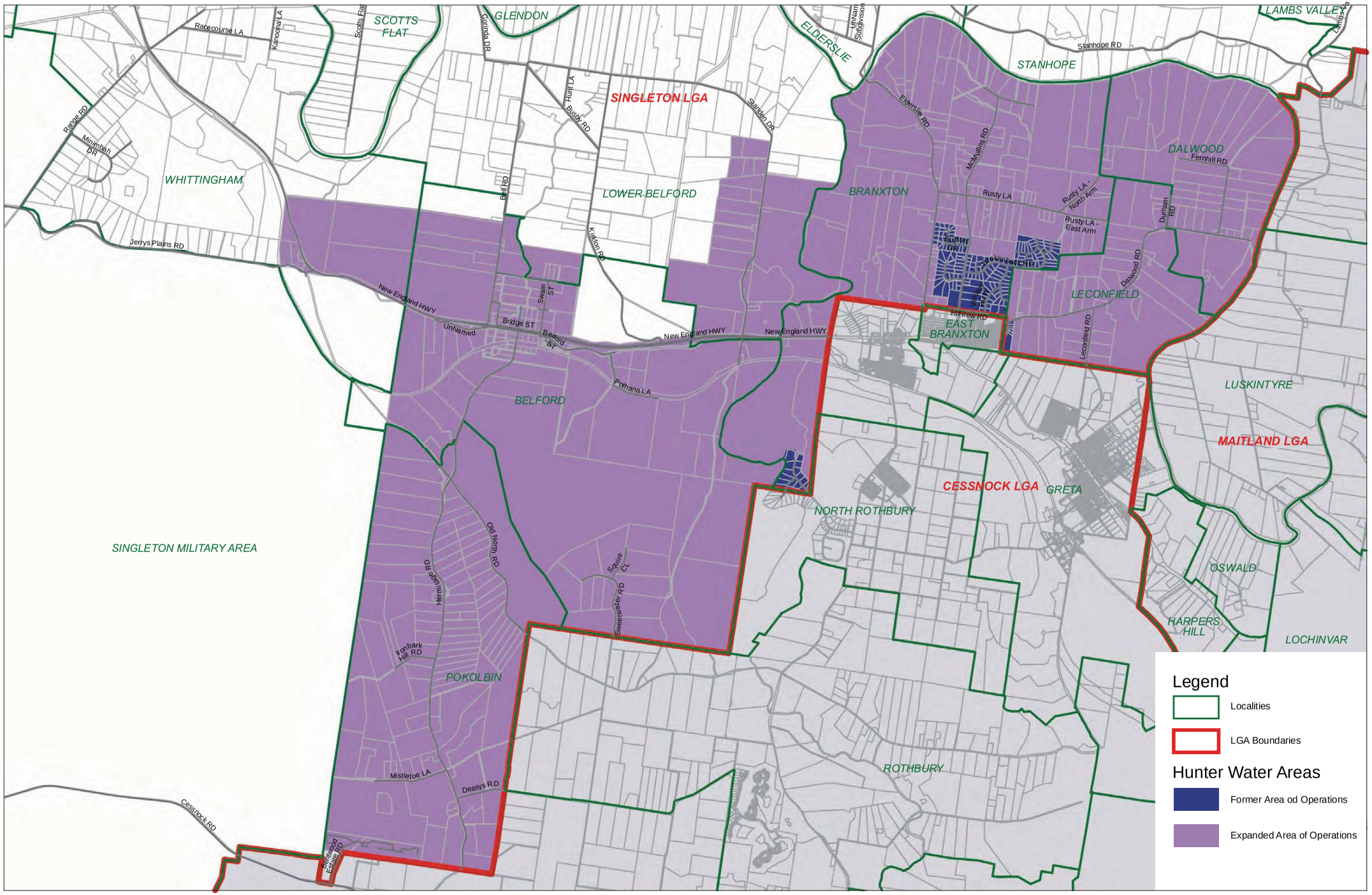
0 A3 is 1:7500 250 m

issued 11 June 07

Fig 4.3C



Source: Singleton Shire Council 2007

Singleton Land Use Strategy

WATER AND SEWER SERVICE AREA - BRANXTON

0 A3 is 1:65,000 2.5 km

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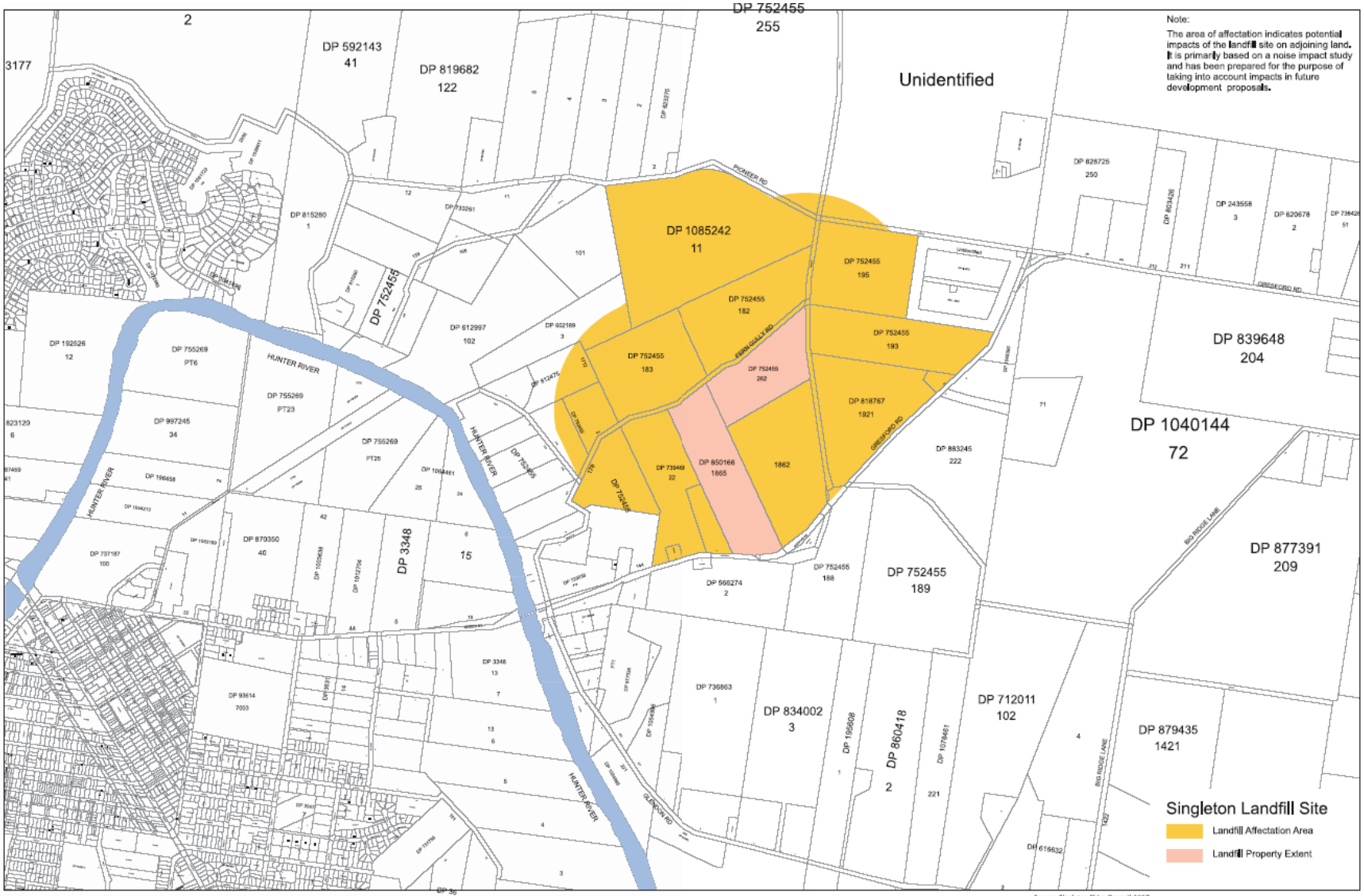
issued 20 Sep 08

Fig 4.3D



Source: Singleton Shire Council 2007

Singleton Land Use Strategy

SINGLETON WASTE DISPOSAL AREA INFRASTRUCTURE

prepared by planning workshop australia
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0 A3 is 1:15,000 500 m

issued 18 June 07

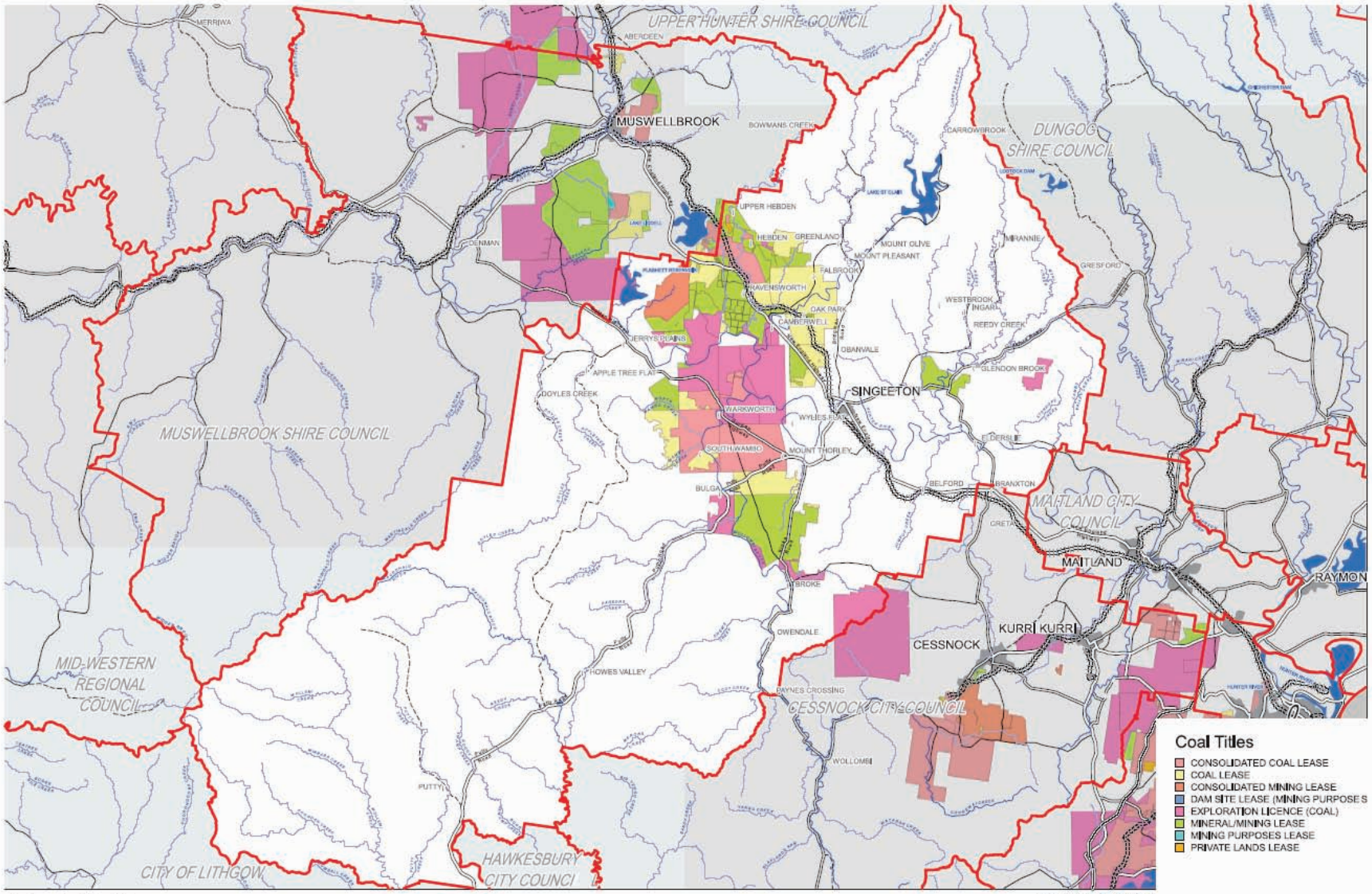
Fig 4.4

Table 3: Summary of key infrastructure issues

WATER SUPPLY	
Singleton	The town of Singleton is well placed in relation to existing urban water supply, and potential future demands with a supply from the Glennies Creek Dam via a pipeline. Residential and surrounding rural residential areas currently have an adequate water supply of good quality. All existing residences in the town area are supplied with treated water, plus some outside but close to the boundary. A non potable water supply is provided to some properties along the Glennies Creek Dam pipeline route.
Mt Thorley	A potable water supply is provided to the Mt Thorley Industrial Estate from Obanvale Water Treatment Plant via trunk mains.
Jerrys Plains	A potable supply was provided to the Jerrys Plains Village area, only, in 2004.
Broke	A potable water supply for Broke was provided in July 2007 from Obanvale Water Treatment Plant, via trunk mains.
Branxton (rural residential)	Water supply to rural residential allotments is provided by Hunter Water Corporation under an agreement with Singleton Council. The Hunter Water Corporation area of operations within Singleton LGA has been extended. The extension of the area of operation will not guarantee that land will be serviced.
SEWERAGE	
Singleton	Sewerage is connected to all dwellings within the town boundaries where economically feasible, and only a small number of properties are not connected. Council operates one sewage treatment plant at Doughboy Hollow south of Singleton. Sewage is now collected from Maison Dieu Industrial Estate and surrounding rural residential areas via a low pressure pump out system. Limited private pump out systems available to town sewerage immediately adjoining town boundaries.
Branxton	Sewerage service to some rural residential allotments is provided by Hunter Water Corporation under an agreement with Singleton Council. The future boundary of sewerage supply has not been determined, and is subject to further agreement.
ACCESSIBILITY AND TRANSPORT	
Highway	The sections of National and State Highway within the Singleton LGA are the responsibility of the Roads and Traffic Authority (RTA). Singleton Council maintains sections of these roads under contract to the RTA. Consideration needs to be given to proposing a Singleton bypass for the New England Highway.
Urban roads	Urban roads are in reasonable condition, although there are some limitations on capacity. A traffic and parking study and plan is in the process of being undertaken to determine a plan to address these issues, and will assist in determining the future road hierarchy and traffic management measures. A proposal for a link road concept is in the process of implementation. This is an important infrastructure link which will connect future urban development opportunities.

Rural roads	Existing road network adequate to cater for expected demand with ongoing sealing program for gravel roads, and developer upgrading associated with individual development proposals. The main issues relate to the provision of adequate carriageway width, sealing of unsealed roads and level of service of intersections. Growth in traffic volumes on rural roads is primarily limited to areas in the east and south of the LGA, especially in the Branxton/Stanhope and Broke/Fordwich areas.
Public transport	Public transport includes limited rail services and regional and interstate buses provided by private providers. A limited private town bus service operates, together with an extensive school bus network servicing a large proportion of the LGA.
Bikeways	A small network of recreational bikeways exists, which is proposed to be progressively extended in accordance with the Singleton Bike Plan.
STORMWATER	
Singleton	Issues with stormwater infrastructure are ageing capacity and water quality. Works are underway to improve provision of stormwater infrastructure.
Villages	Generally no formal trunk reticulated stormwater drainage system. Relies on natural drainage and soil infiltration.
WASTE MANAGEMENT	
Whole LGA	Provision of waste management facilities is a Council function in the Singleton LGA. Singleton Council operates one licensed waste management facility off Dyrring Road, about 5km from Singleton. The Council's Capital Works Program includes provision for new landfill extensions, together with a range of resource recovery services over a period of several years, to 2015. Waste services will continue on the current landfill site potentially to at least 2025, although the makeup and extent of services on the site may be modified. A building exclusion zone around Singleton landfill has been proposed to provide a buffer to prevent incompatible uses. Council has advised that it now intends to establish a residential dwelling exclusion zone within the "Landfill Affectation Area" identified in Figure 4.4.
BUSHFIRE FACILITIES	
Whole LGA	Reasonable provision exists for bushfire service provision within the LGA. This is provided by the NSW Rural Fire Service in conjunction with Singleton Council.
OPEN SPACE	
Singleton	Active and passive open space needs are currently well catered for. Key issue is the quality of the open space and maintenance costs. In new development areas, future consideration needs to be given to protection of biodiversity values on Council open space land (need for adequate size, shape and connectivity).
Rural areas	Active and passive open space needs are currently well catered for in rural areas.

The substantial coal resources within Singleton LGA significantly affect land use and settlement structure. Current mining titles and Mine Subsidence Districts are shown on Map 4.5.



Singleton Land Use Strategy

COAL MINING TITLES & MINE SUBSIDENCE DISTRICTS

prepared by planning workshop australia

Fig 4.5

Climate conditions are an important factor for settlement and are closely related to economic development opportunities. Over the life of the Strategy, there is an identified need for the community to adapt to climate change, and also to respond to the causes of climate change. Overall, Singleton LGA is poorly adapted to cope with climate change, for the following reasons:

- The urban structure is relatively dispersed, relies on high energy use (primarily motor cars), and there is a high degree of long distance commuting for employment.
- Water availability is limited but demands for all land uses are increasing. Agriculture on prime agricultural land is largely dependent on irrigation.
- The economic structure of the area is highly dependent on high carbon emission industries (coal mining and electricity generation).
- Anticipated new developments are not greenhouse gas neutral.

Combined with other initiatives, the Singleton Land Use Strategy can provide a framework for responding and adapting to climate change. In particular, to respond to climate change and reduce greenhouse gas emissions caused by the present economic and land use structure, it would be desirable to implement targets and approaches including:

- Support and provide incentives for new industrial and commercial development that is located close to the town, is carbon neutral, and provides onsite water servicing.
- Support enhanced public transport and accessible access networks (including pedestrian and cycle networks).
- Require future urban development and subdivision design to ensure that 100% of lots provide suitable orientation for passive energy efficiency.
- Ensure that economic impacts of rural residential development areas are fully costed, and that costs are recovered through financial contributions arrangements at the subdivision stage.
- Proactively promote a greenhouse gas neutral approach to coal mining within the LGA, including limiting further geographic extension of coal mining to present approved areas.

4.4 Biodiversity and natural ecosystems

Singleton LGA supports extensive biodiversity as a result of its topography, geology and climate. It includes parts of the North Coast and Sydney Basin Bioregions and supports extremely diverse biodiversity as a result of its varied topography, geology and climate. The area is botanically significant because it represents a zone of transition between the coast and inland, and between northern and southern botanical regions. As a consequence, it includes the eastern limit of distribution of some species, and the northern and southern limits of distribution of other species.

Significant proportions of some vegetation communities have been cleared, with the result that much of the remaining native vegetation is of significance (especially in the central Hunter Valley Lowlands). Although approximately 34% of the total area of

the Singleton LGA is included within dedicated conservation reserves (mainly in Wollemi, Yengo and Mt Royal National Parks), this protects only a limited range of the vegetation types and ecosystems occurring within the area.

Some significant characteristics of biodiversity and natural ecosystems occurring within the Singleton LGA are as follows:

- Seven listed endangered ecological communities, 53 fauna species, and 15 flora species listed as threatened under the Threatened Species Conservation Act 1997 (NSW).
- Three of the national parks have World Heritage listing (Central Eastern Rainforest Reserves and the Greater Blue Mountains World Heritage areas).
- Two listed threatened ecological communities and 45 flora and fauna species listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth).

The number of listed threatened species and threatened/endangered ecological communities has progressively increased over time, and this trend is expected to continue. Land use responses require improved and regularly updated information, especially in areas likely to be subject to land use change and development pressure. Land use and development are required by State and Commonwealth legislation to take into account environmental impacts on biodiversity, including threatened species and endangered ecological communities.

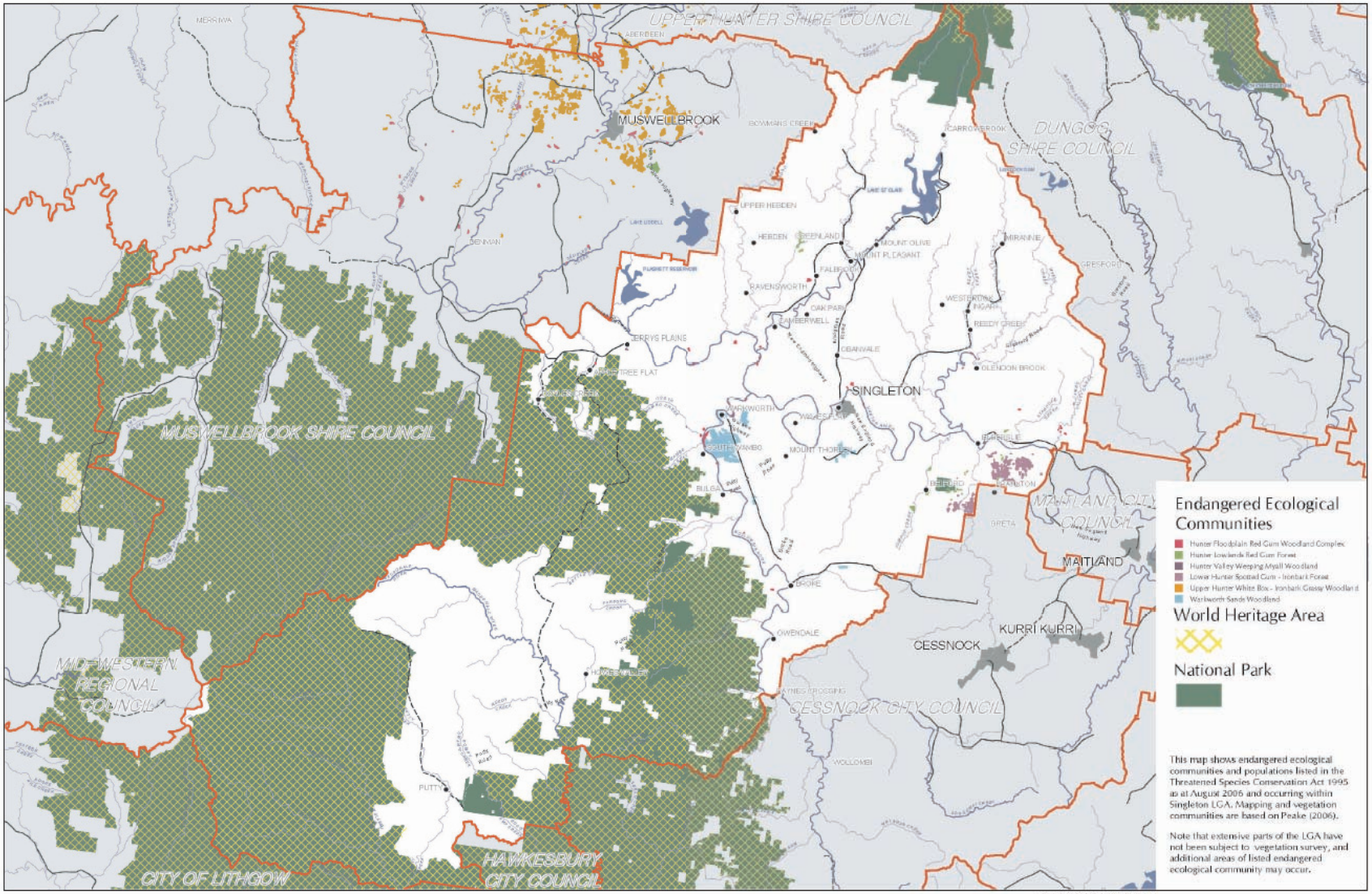
Map 4.6 shows key biodiversity constraints including conservation areas, and some areas identified as endangered ecological communities in the central Hunter Valley Lowlands geographic areas of the Singleton LGA.

4.5 Land and water

Land and water issues are closely related to land use, especially economic activities such as agriculture and urban settlement. In affecting land use change, the Strategy must consider important issues including land capability and land degradation, water availability and quality, flooding and bushfires. The characteristics of the LGA are summarised in the Situation Analysis report, and some of the key characteristics (river sub-catchments, land capability, and bushfire prone vegetation) are shown on Maps 4.7 and 4.8. Separate mapping of flood prone land is also available for some areas.

4.6 Design issues

Design issues apply primarily at the site development scale, and in the Strategy are secondary in importance to the issues of settlement structure and infrastructure, biodiversity and natural ecosystems, and land and water. Background to these issues is included in the Situation Analysis report, and the framework for consideration of these issues needs to be included within the Strategy. Important design issues include heritage conservation and environmental design, and Maps 4.9A and 4.9B show the boundaries of heritage conservation areas recognised in urban areas of the LGA. Heritage conservation issues have been included in relevant sections of the Strategy, as they apply to the key issues.



Singleton Land Use Strategy

Source: Singleton Shire Council 2007

CONSERVATION AREAS & ENDANGERED ECOLOGICAL COMMUNITIES

prepared by planning workshop australia
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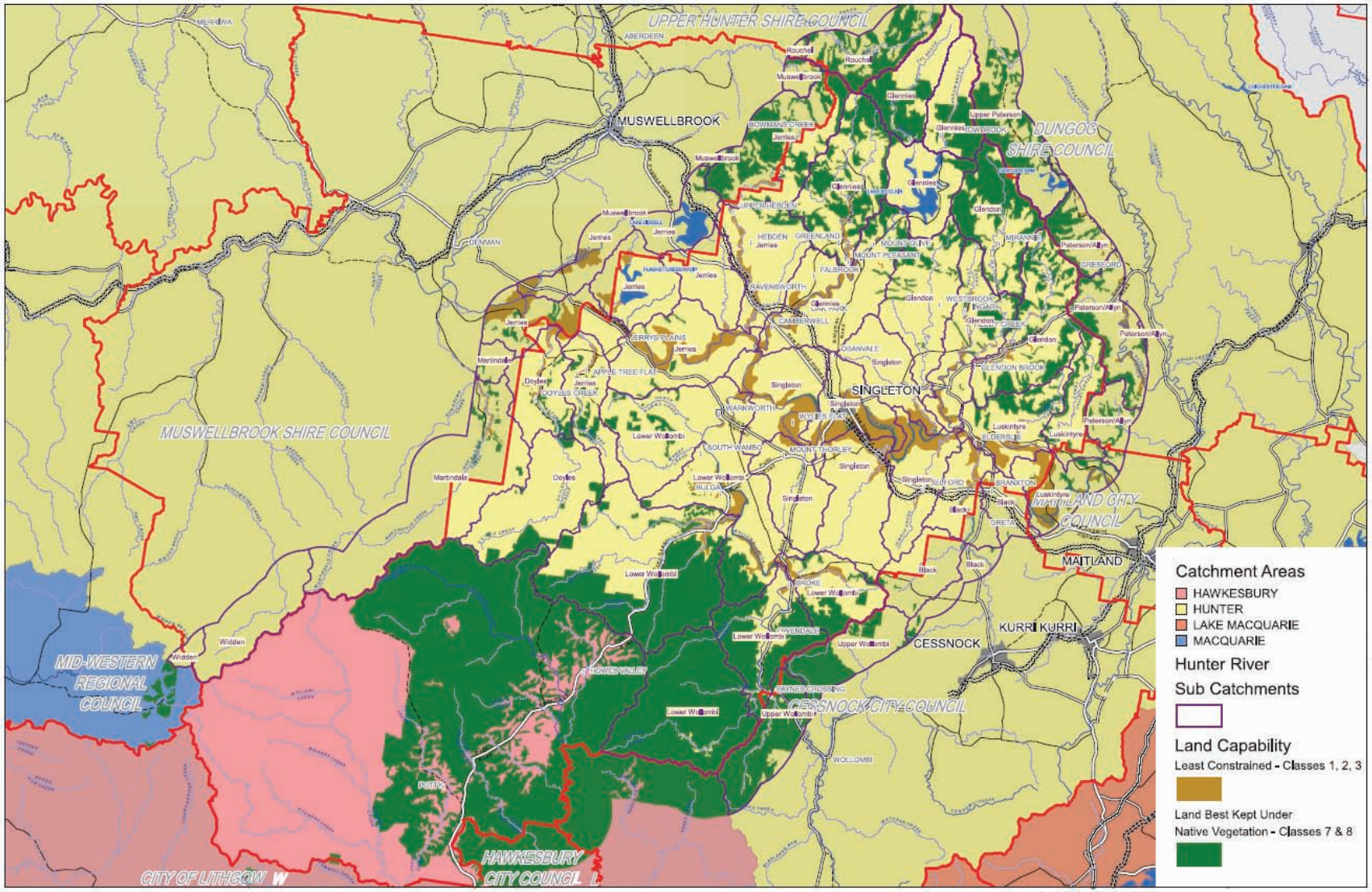
Issued 10 June 07

Fig 4.6



Source: Singleton Shire Council 2007

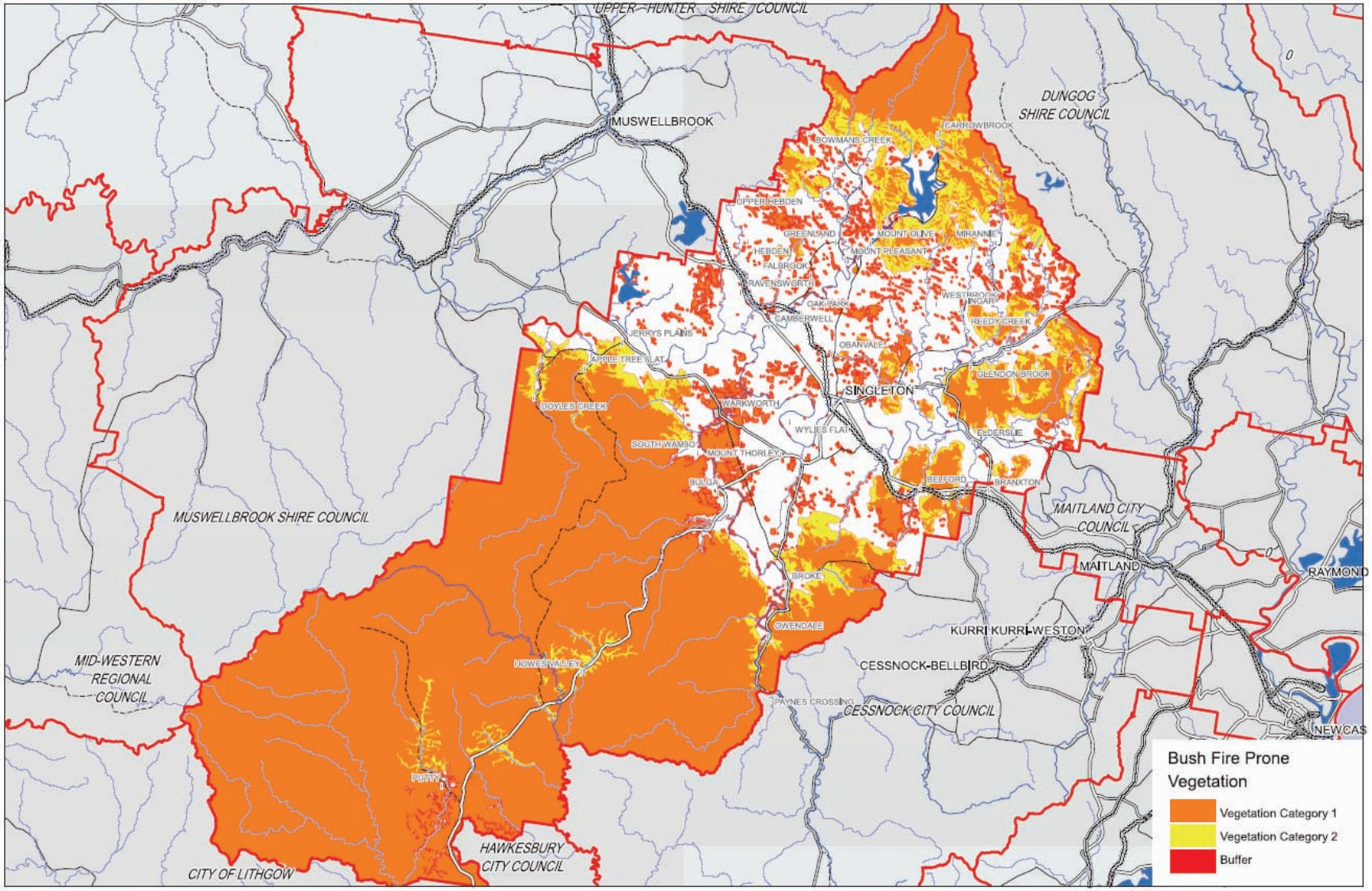
Singleton Land Use Strategy

WATER CATCHMENTS AND LAND CAPABILITY

prepared by planning workshop australia

A3 is 1:400,000 10 km

Fig 4.7



Singleton Land Use Strategy

Source: Singleton Shire Council 2007

BUSH FIRE PRONE VEGETATION

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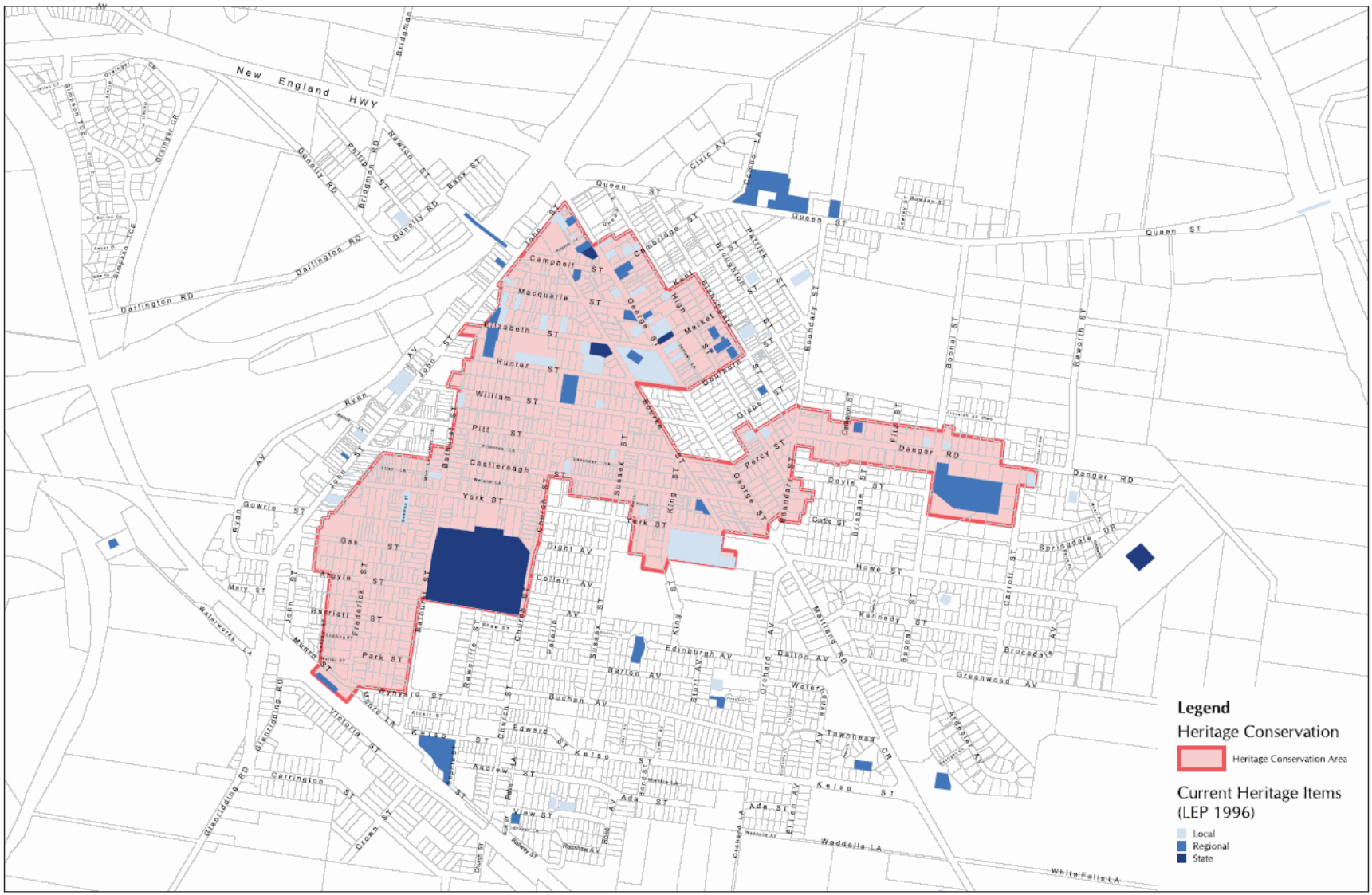
A3 is 1:400,000 10 km

issued 10 June 07

Fig 4.8



Source: Singleton Shire Council 2007

Singleton Land Use Strategy

HERITAGE CONSERVATION AREA - SINGLETON

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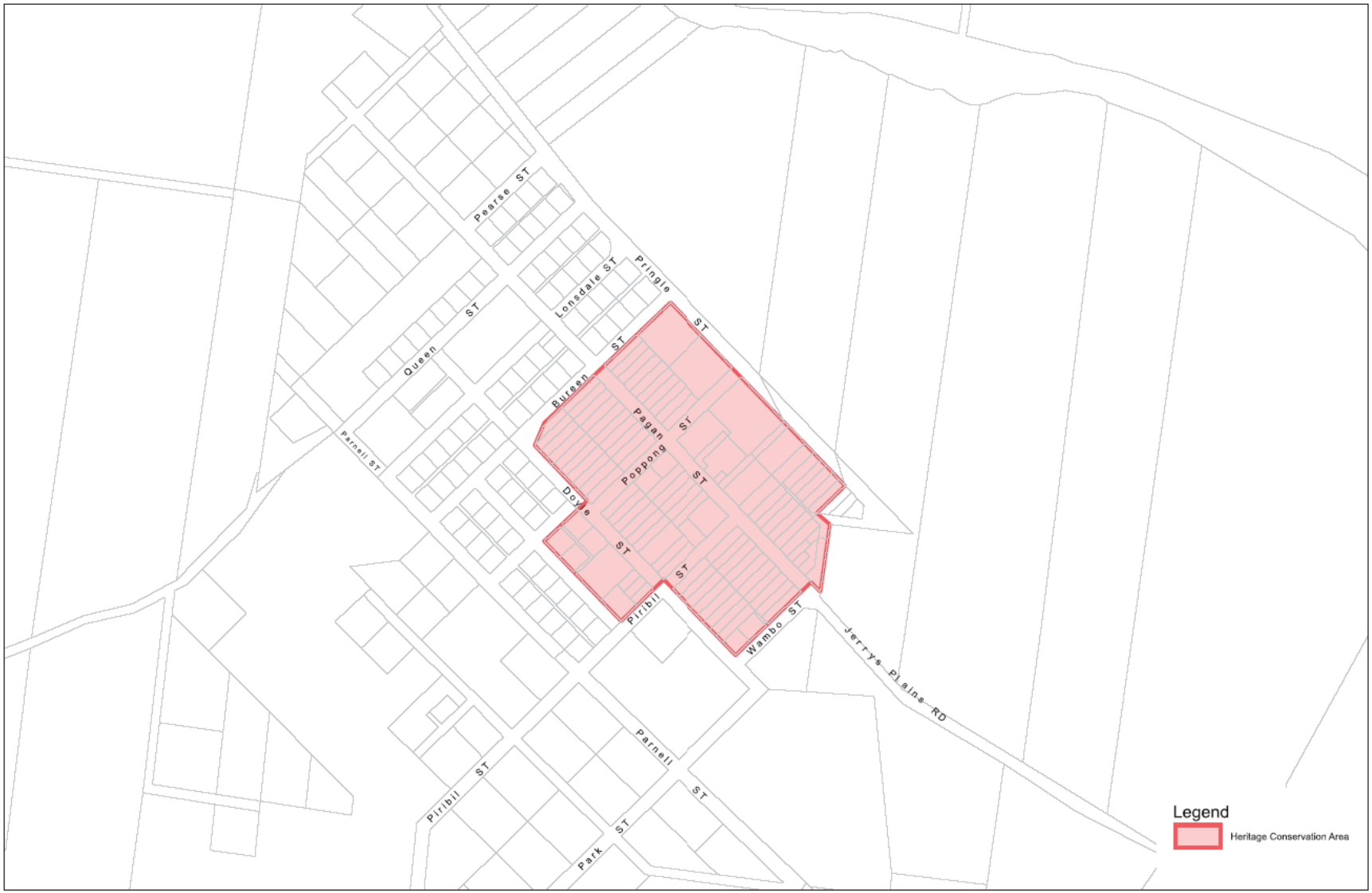
issued 11 June 07

Fig 4.9A



Source: Singleton Shire Council 2007

Singleton Land Use Strategy

HERITAGE CONSERVATION AREA - JERRYS PLAINS

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issued 11 June 07

Fig 4.9B

5 GENERAL AIMS AND OBJECTIVES

General aims and objectives for land use within Singleton are outlined in this section. These aims and objectives take into account the vision expressed by the Council, the strategic objectives of existing plans applying within the LGA, and the objects of the *Environmental Planning and Assessment Act 1979*.

The Strategy provides a consistent direction for land use and community decision-making, and allows flexibility to respond and adapt to variations in the actual growth rate over time.

The Strategy's general aims and objectives are outlined below. These are largely based on the Singleton LEP 1996 objectives. They have been prepared in a form to enable incorporation into subsequent LEP provisions, and to align with Council's 2030 Strategy. The aims and objectives are:

(a) to provide a framework for controlling and co-ordinating development within the Singleton local government area

(b) to ensure the most appropriate and efficient use or management of land and natural resources

(c) to co-ordinate economic development so that there is optimum and equitable economic and social benefit to the local community

(d) to ensure that the environmental impact of development is adequately assessed, including the consideration of alternatives

(e) to establish a pattern of broad development zones as a means of:

  (i) separating incompatible uses

  (ii) minimising the cost and environmental impact of development

  (iii) maximising efficiency in the provision of utility, transport, retail and other services

(f) to retain options for alternative land use strategies so that flexibility to allow economic, social and environmental change can be accommodated

(g) to encourage adoption of land management practices which are sustainable over long periods of time without degradation of natural environmental systems

(h) to provide adequate protection and minimise risk for the community (as far as possible) from environmental hazards, including flooding, soil erosion, bush fires and pollution

(i) to enable public involvement and participation in environmental planning and assessment

(j) to progress development in an ordered and economic manner.

In addition to the general aims and objectives outlined above, local environmental plans are required to have specific objectives for each land use zone identified within the scope provided by the NSW Government standard plan provisions.

6 URBAN SETTLEMENT

This part outlines the land use policies and strategies for urban settlement, and requirements for accommodating urban growth and change. Key issues are the provision of additional urban land, suitable housing to cater for the ageing population, and provision of industrial land and service infrastructure. The population of Singleton LGA is expected to increase in the Strategy time frame (25 years to 2032), and housing and settlement requirements are also expected to change. The population forecasts used in the Strategy are for a 15 year time frame, within the context of a 25 year Strategy, to provide sufficient infrastructure and urban land for future long term requirements. The population forecasts should be reviewed and updated after 5 to 10 years. The approach taken in the Strategy will affect how large Singleton will grow, and its long term structure.

Growth will be influenced by national and Sydney metropolitan conditions and trends, as well as growth in local and regional employment and changes in commuting patterns. It could be expected that factors influencing commuting patterns (e.g. increasing transport costs) may affect housing demand, and the spatial location of this demand within the LGA (e.g. the relative proportion located within residential and rural locations). As family sizes decline, it is likely that a higher growth rate for smaller sized dwellings will occur, including single storey dwellings for aged persons.

Additional residential zoned land is expected to be available in the near future following the amendment of the existing LEP provisions in Singleton Heights. This relates to the Huntergreen, Bridgman Ridge, and Gowrie Links proposals, and will ensure an adequate supply of residential land for at least 10 to 15 years. The Strategy needs to consider development options for the town over a longer period as well.

There is currently reasonable provision of urban infrastructure and services (e.g. roads, electricity, water and sewer) for the town of Singleton. Water supply limits and economic limits on service extensions have been taken into account in formulating the Strategy. Minimal growth is expected in villages, and there are servicing limits in all village areas.

Social infrastructure, community services and recreational facilities are reasonably well catered for within Singleton, although the trend for increasing centralisation of many specialist services means that these are located in Maitland and Newcastle, and transport must be available to access these. Housing affordability and providing adequate suitable aged persons accommodation are expected to continue to be significant issues over the life of the Strategy. These and other matters relating to housing needs were reviewed in the Singleton Community Housing Forum held in November 2006, which emphasised the importance of taking into account the full range of community housing needs in future planning for residential development. The Forum recommended strategies and ongoing actions which have been taken into account in the preparation of this Strategy.

A significant issue over the life of this Strategy is the proposed urban area identified south of Branxton by the Lower Hunter Regional Strategy, including some land within Singleton LGA. While this has potential for around 2000 residential lots in Singleton, planning processes have been established to determine a structure plan, and the urban boundaries are to be defined through future local planning. Planning and

development within this area will primarily be aligned to growth within the Lower Hunter Region, and is not expected to significantly impact on growth and demand projections for Singleton identified in this Strategy. Policies and strategies for the South Branxton area are included in Section 8.8.

The following estimates in Table 4 are adopted/assumed for the purposes of the Strategy. These estimates are based on the Situation Analysis report, and it should be noted that these are for the LGA as a whole, and that there is considerable variability between different planning areas.

Table 4: Summary of Singleton LGA projections and trends

Strategy forecast	Estimate (25 years to 2032) - update	Comment
POPULATION CHANGE	Estimated 1.5% per annum growth (average 300 persons per year). Approximate population 27,500 in 2021.	Significant fluctuations from year to year would be expected. Most growth would occur in Singleton Heights (North Singleton).
Dwelling occupancy rate	Decline from 2.8 persons per dwelling to 2.5 persons per dwelling	Ongoing decline in occupancy rate, alone, creates demand for an average additional 43 dwellings per annum.
RESIDENTIAL DEMAND	Average 170 to 230 new dwellings per year	Depends substantially on dwelling occupancy rate and dwelling type availability.
Changes in type of dwellings required	Increase in small single dwellings, aged persons accommodation (especially single storey), and units/townhouses	Lower demand for large houses (i.e. 3 to 4 bedrooms) likely in long term
Urban/rural split	By 2021, urban Singleton is expected to have a population of 17,750 with 9,750 in rural areas.	It is anticipated that 60% of additional dwellings provided to 2021 will be in the Singleton Heights/North Singleton urban area, 5% in Singleton town area, and 35% in rural areas.
INDUSTRIAL LAND	Projected annual demand for light industrial land (3 to 6 ha per annum).	Variable depending on regional demand and supply.
URBAN WATER DEMAND	Average yearly urban water demand is 350kl/annum	Long term trend in water use is not clear, but usage has been reduced by recent water restrictions.

Strategy forecast	Estimate (25 years to 2032) - update	Comment
AVERAGE URBAN TRANSPORT ACCESSIBILITY (index of people within walking distance of bus route or CBD)	Figures currently unavailable, but trend is for declining transport accessibility.	Continuing relative population dispersal (especially in rural areas) is expected to increase reliance on car transport, and reduce opportunities for viable public transport.

Key land use planning issues regarding urban settlement in the Singleton LGA were identified in the Situation Analysis as follows:

- Projected residential land requirements
- Identification of areas for long term urban expansion around Singleton
- Town infill development opportunities and constraints
- Water and sewer capacity and service areas
- Road hierarchy, transport links and accessibility
- New England Highway Bypass for Singleton
- Development guidelines for highway frontage land
- Adequacy of land for industry and commerce, and requirements for additional land and services
- Floodplain development and management
- Availability of suitable sites for future institutional use

Objectives, policies and strategies for each of these are presented individually below.

6.1 Projected residential land requirements

This section relates to how much residential land and housing will be required, its type and characteristics. Section 6.2 relates to where future urban land is best located.

Housing in Singleton is principally in the form of individual detached dwellings, representing 88% of the housing stock in 2006. This contrasts with NSW as a whole where 70% of dwellings were separate dwellings. The NSW proportion of medium density housing is 29% with Singleton having a much lower 10% of dwellings in this category. The dwelling occupancy rate for the LGA has shown a steady decline and was estimated at 2.9 persons per dwelling in 2006, slightly above the NSW figure of 2.7.

Future dwelling approvals of between 170 and 230 per year could be anticipated for the next 10 - 15 years assuming a continuation of current economic conditions.

Approximately 60% of total LGA population growth would be expected to occur within Singleton Heights/North Singleton and 5% in Singleton Town.

A local environmental plan amendment which has recently been finalised zones additional land for residential purposes in North Singleton is expected to ensure an adequate supply of zoned residential land for the next 15 years. Existing local environmental plan zones are shown on Map 6.1. The Huntergreen and Bridgman Ridge residential areas are located to the north of the existing Hunterview area, and have a combined area of approximately 240 ha, and an expected residential lot yield of between 1,100 and 1,200 lots. In addition, the proposed Gowrie Links residential area could supply an additional 450 to 550 lots. However, there are potential limits on water and sewer provision to service these residential areas which will require investment and upgrading of infrastructure, and may limit the land actually available to the market.

While a key feature of the Strategy is to provide for additional residential development in the urban area of Singleton, there are also a range of other housing issues that need to be considered in conjunction with this, that relate to housing affordability and suitability for anticipated demographic changes. These are considered in Section 6.3.

Objectives – residential land requirements

- Singleton will have urban land that is zoned and serviced to meet projected housing needs up to 2032.
- Housing will vary in size and form to meet changing household formations and the needs of an ageing population.

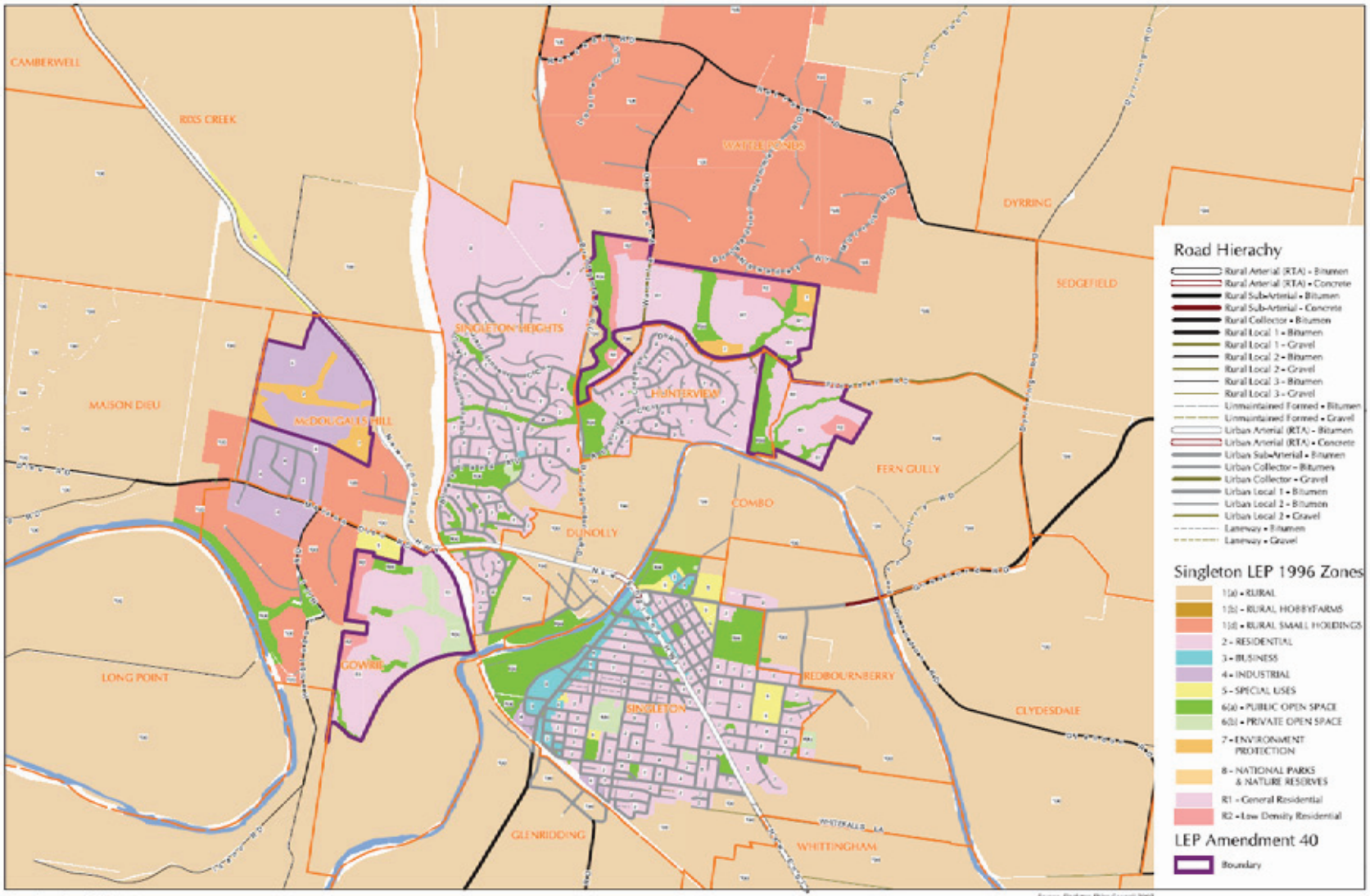
Policies – residential land requirements

- Maintain a minimum of 5 years supply of zoned residential land.
- Encourage aged persons accommodation (with suitable style, location and access to services).
- Support the provision of affordable housing requirements by maintaining adequate residential land.
- Facilitate medium density in existing residential areas, subject to accessibility, urban design, amenity and sustainability criteria.
- For new greenfield residential development, consider seeking planning agreements with developers to provide for residential development of a certain type, and/or affordable housing (e.g. medium density and single storey aged persons accommodation).
- Recognise the need to cater for different sectors (youth, aged persons and construction workforce accommodation).
- Ensure public transport accessibility for all residential development, and provision of shopping and other facilities within walking distance.

- Urban sustainability issues will be considered in the determination of new areas for urban expansion (e.g. future water recycling, protection of biodiversity values, road and subdivision layout to provide optimum orientation for solar access).
- Maintain existing residential character by limiting subdivision.

Strategic Actions – residential land requirements

- Facilitate LEP amendments to supply a minimum of 5 years of residential development potential through zoning based on demand/supply analysis undertaken.
- Ensure demand and supply analysis also considers available infill opportunities.
- Implement zoning consistent with Standard LEP recommended zones.
- Undertake periodic review and updating of growth projections to coincide with the release of ABS Census data.
- Ensure appropriate LEP provisions to encourage/enable smaller, single storey residential development in close proximity to transport and facilities, and located on flatter sites.
- Prepare a DCP to identify appropriate sequencing of development.
- Recognise Aboriginal heritage protection requirements in LEP provisions.
- Take into account future limits on water availability and anticipated requirements for increased energy efficiency by adopting sustainability criteria (e.g. 100% energy efficiency lot orientation, and suitable street layout) in LEP or DCP
- Provide for parks within walking distance of all homes in accordance with Open Space and Recreation Needs Study (2002).
- Maintain existing residential character by including minimum subdivision area requirements in LEP provisions. Resubdivision is to be consistent with existing character (e.g. 450m^2, 1200m^2, and 2500m^2 minimum areas in Bridgman Ridge area).
- Ensure appropriate LEP provisions to enable smaller, single storey residential development in close proximity to transport and facilities on flatter sites.
- Consider introducing sustainability targets for new buildings (e.g. energy efficiency, onsite renewable electricity generation, building recyclability and durability, carbon neutrality etc.



Singleton Land Use Strategy

Source: Singleton Shire Council 2007

SINGLETON - CURRENT ZONING

prepared by planning workshop australia

Issued 11 June 07

Fig 6.1

6.2 Identification of areas for long term urban expansion around Singleton

As outlined in Section 6.1, there is adequate existing provision for residential land within the time period of the Strategy. While there is no immediate need for further residential land in the Strategy time frame, it is essential to review the long term (25 to 50 year) urban expansion opportunities for Singleton, and to ensure that these are not prejudiced by short term development. This section focuses on the future urban structure of the town, major servicing and accessibility requirements, and the criteria that should be applied to future development proposals that may arise in long term urban growth areas.

The town of Singleton is particularly constrained by its physical setting, and surrounding land uses (i.e. coal mining and army camp). While the future long term growth of Singleton cannot be predicted, there are options that would provide for substantial future urban growth if this was ever required (e.g. doubling of the urban population in 50 years). These options are reviewed in Table 5 and could secure future land in the event that this is ever required. No detailed investigations have been undertaken.

Table 5: Summary of long term urban expansion options

Option	Comments
Singleton North East	The 1974 Singleton Planning Study found that north east expansion was the best long term urban expansion option. Since that time, this option has been made more difficult by land fragmentation, and is affected by the Singleton Waste Management facility. Physical constraints include undulating slopes, salinity and erodible soils, and presence of native vegetation. Development of this area would require improved road links, including upgrading Pioneer Road to Dyrring Road. This area has reasonable potential for servicing with water and sewer. It also may be affected by the continuation of or future land use on the current Singleton Landfill site.
Singleton West	The Singleton Planning Study ruled out urban expansion to the west as a result of proposals for open cut mining. Mining commenced in about 1990 and could be expected to be substantially completed within 20 – 30 years. This would make land potentially available for urban development. Advantages of this option are that land is generally flatter and would have better highway access, with opportunities for commercial development sites.

Option	Comments
Town infill	Although there are larger sites with potential for additional residential development, substantial increases in density within Singleton Town should be discouraged as a result of flooding potential. Heritage conservation issues also would support retaining existing density. Opportunities exist for increased densities and alternative housing types in Singleton Heights, but may require reconsolidation of existing lots. Further investigation would need to be undertaken, but it appears that there are limited opportunities available.
Singleton North	Urban expansion to the north between the railway line and Bridgman Road is a possibility, but would result in a narrow, linear urban area. As a long term option with an additional New England Highway link, and the opportunity of providing a future railway station, there may be some accessibility benefits arsing from this proposal. It would also allow incremental growth and future expansion to the west of the railway line. Location of suitable commercial land and schools represents a challenge. Council has also advised that the area may be impractical to sewer due to limited mains capacity through existing residential areas back to the treatment works.

Map 6.2 shows the conceptual location of the long term urban expansion options for Singleton. Map 6.3 shows current and proposed accessibility and transport links, and additional desirable links for investigation. This map does not include a long term highway bypass for Singleton, which is discussed in Section 6.6. Water, sewer and servicing are key issues requiring further investigation, and future access requirements and locations of commercial and industrial land also need to be taken into consideration.

The Strategy addresses this issue as outlined below, and should identify a preferred concept for long term urban expansion.

Objectives – Identification of areas for long term urban expansion around Singleton

- To limit the exposure of the town to major flood events, by preventing additional land being developed for residential purposes on the floodplain.
- To consolidate existing urban areas and increase the density within existing flooding and infrastructure capacity constraints.
- To identify land which should be investigated for long term future expansion and to zone this appropriately to prevent subdivision and inappropriate land use.

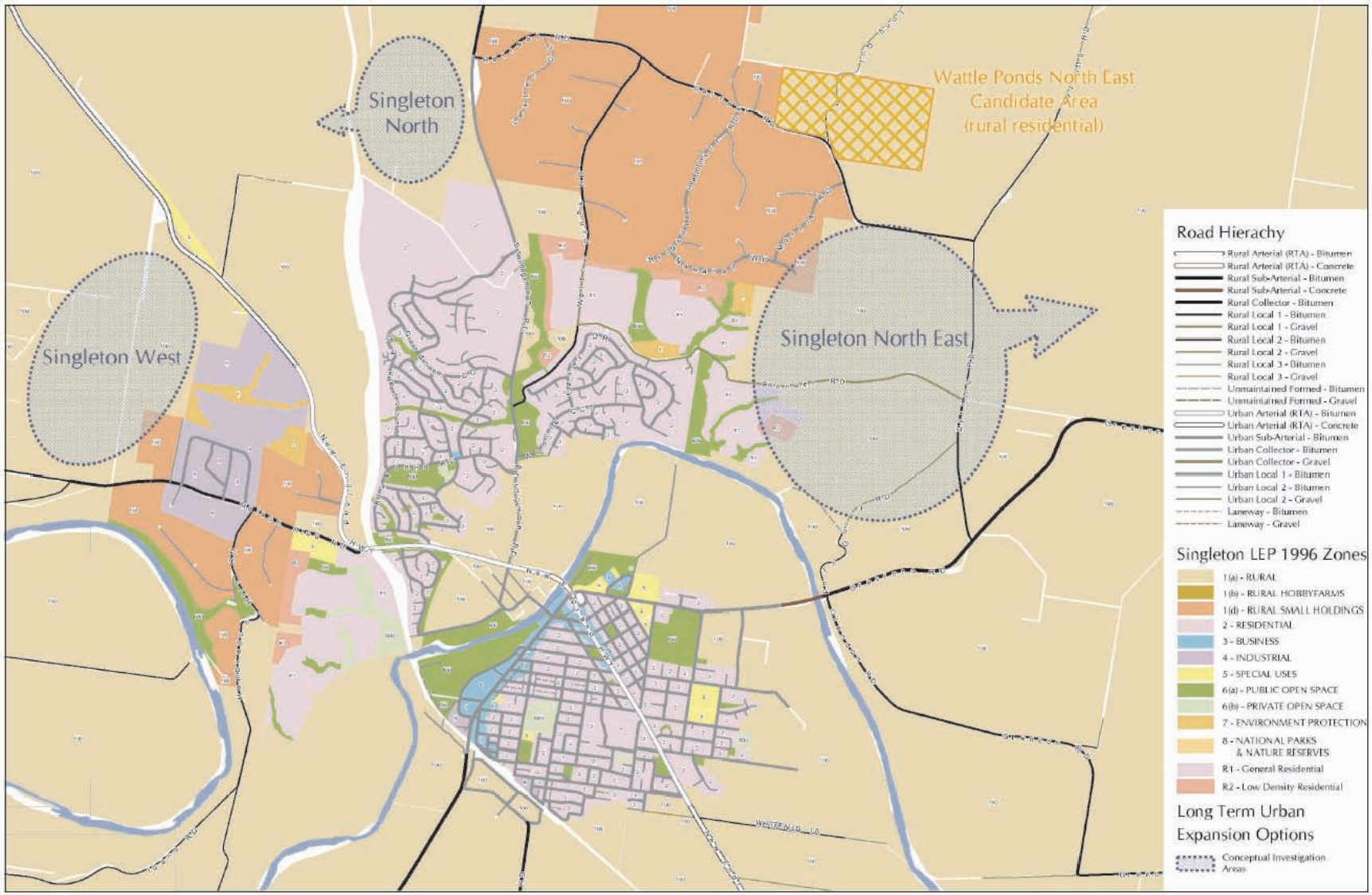
Policies – Identification of areas for long term urban expansion around Singleton

- Potential urban expansion areas shown on Map 6.2 should be investigated, with preference given to the Singleton North East option.
- Review and finalise transport hierarchy and accessibility proposals based on Map 6.3.
- Provide land for residential development (to ensure 5 years supply) based on following attributes:
    - Flat-moderate grades
    - Service and infrastructure capacity/staging
    - Access to community services and facilities
    - Access to convenience/other retail
    - Road access
- Direct urban growth to areas where effective use could be made of existing urban infrastructure/reserve where capacity is available (see also sections 6.3 and 6.4).
- Maintain a minimum of two development fronts to maintain competition.
- Prevent further subdivision or non-reversible land use within the identified preferred investigation area for future urban expansion.
- Maintain a future urban growth corridor. Prevent subdivision and limit development within the possible future corridors for urban expansion as identified on Map 6.2.

Strategic Actions – Identification of areas for long term urban expansion around Singleton

- Make detailed investigations of each of the potential urban expansion shown on Map 6.2 and listed in Table 5 by 2010.
- Review LEP zoning options within potential urban areas.
- Consider desirable LEP provisions to limit subdivision within potential urban investigation areas to prevent future fragmentation of land.
- Finalise future transport hierarchy and accessibility requirements based on Map 6.3.
- Determine criteria limiting consideration of future proposals for urban rezoning, unless it is in an identified long term investigation area, and facilitates economic water and sewer servicing, and supports future transport hierarchy and accessibility requirements.
- Review Section 94 plans to ensure that long-term growth is financially sustainable and facilitates the preferred urban structure.

- Prepare policies for facilitating planning agreements for large development proposals which support the preferred long term urban structure.
- Identify a buffer around the Singleton waste management facility, and review options for future long term urban/industrial use. As an interim measure, implement a residential exclusion zone within the "Landfill Affectation Area" shown in Figure 4.4.
- By 2015, undertake detailed investigation for long term urban development options/town boundary in the north-west, taking into account future coal mining prospects and impacts.
- Consider the following LEP zones and minimum lot sizes for residential development:
    - R1 General Residential with a minimum lot size of 450m^2
    - R2 Low Density Residential with 2 minimum lot sizes (indicated on the lot size map), being 1200m^2 and 2500m^2.



Source: Singleton Shire Council 2007

Singleton Land Use Strategy

SINGLETON - LONG TERM URBAN EXPANSION OPTIONS

prepared by planning workshop australia
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Fig 6.2

6.3 Town infill development opportunities and constraints

Although there is still a clear market preference for conventional detached housing on the fringe of the existing urban area, infill residential development is an important consideration. Key issues related to infill are:

- Urban design and development scale (especially for 2 or 3 storey development).
- Heritage.
- Infrastructure servicing (especially water, sewer and stormwater).
- Minimum subdivision size and dimensions, and opportunities to facilitate consolidation of existing lots.
- Dual occupancy design and siting guidelines.
- Potential for integration into mixed use commercial/residential developments.
- Flood issues.

Singleton Council's Heritage Advisory Committee has reviewed and updated the schedule of heritage items listed in the existing local environmental plan, and is also undertaking a review of heritage conservation area boundaries.

Objectives – urban infill development

- Support urban infill development subject to an appropriate planning framework.
- Ensure planning controls allow appropriate residential infill development, taking into account important issues including flooding, adequacy of servicing, streetscape and urban character, heritage, and water sensitive urban design.

Policies – urban infill development

- Residential infill development in Singleton Heights will be encouraged in addition to further greenfield development outside the existing urban area.
- Residential infill development in Singleton Town will be subject to ensuring that the number of dwellings subject to flooding potential will not be increased, heritage conservation guidelines are to be implemented.
- Development should recognise existing infrastructure constraints (e.g. sewer and drainage) and ensure that best use is made of current infrastructure provision.
- Infill development should recognise the character and scale of existing development.

- Future development will take into account policies developed as part of any future housing strategy, including type size, affordability and locational requirements for housing to meet demands.

Strategic Actions – urban infill development

- As part of any proposed infill development, ensure that servicing capacities are assessed and are adequate, particularly water supply, sewerage and stormwater drainage.
- Undertake a review of infill potential and identify constraints to infill development (e.g. flooding, heritage).
- Review minimum lot sizes and DCP controls on infill development to ensure the protection of urban character and residential amenity.
- Establish a significant tree register, and include appropriate tree preservation provisions in the LEP.
- Update heritage registers and information, and incorporate an overlay map in the LEP.

6.4 Water and sewer capacity and service areas

Singleton Council holds a surface water town and water supply licence totalling 5,000 megalitres per annum. The current commitments to supply water, plus an estimate of additional commitments for existing and proposed development areas expanding at current growth rates, indicates that in 10 to 15 years time further water entitlements and alternative sources may be needed.

Short to medium term urban growth areas are catered for in respect of the provision of water and sewer services.

Augmentation of the Waste Water Treatment Works is scheduled for 2010 to 2012, subject to growth rate assessment and a final demand analysis study.

The Council has resolved to investigate supplying the Village of Bulga with water in the longer term, but is yet to commit to providing such services.

The Council has also resolved to investigate supplying sewer services to the Villages of Jerry's Plans and Broke in the long term, but has made no commitment to provide such services.

The recent extension of the Hunter Water Corporation area of operations in the Singleton LGA (Map 4.3d) has potentially significant implications for future urban growth opportunities, and for rural development, particularly around Branxton. Singleton Council should actively be involved in planning for future infrastructure servicing in this area to ensure that future land use is appropriately planned for.

Objectives – water and sewer services

- Provide high quality water and sewer services to urban areas of Singleton (including residential, commercial and industrial land) to meet reasonable demands.

- Provide town water services to the unserviced villages in Singleton LGA, where practical and financially sustainable, and investigate provision of sewer services.
- Ensure provision of additional water and sewer services is financially sustainable.
- Ensure adequate security of water supply by securing additional water entitlements and alternative sources prior to existing allocations becoming fully committed.

Policies – water and sewer services

- Limit the extension of existing water and sewer services around Singleton to areas identified in the Strategy for future urban development.
- Investigate securing additional water entitlements and alternative sources of water to provide for the medium to long term.
- Manage water and sewer services in a financially sustainable manner.

Strategic Actions – water and sewer services

- Investigate the establishment of an agreement between Hunter Water Corporation and Singleton Council in regard to the following:
    - Interconnection of the Hunter Water Corporation and Singleton water supply systems for the purpose of providing drought security and additional water to the Singleton Local Government Area; and
    - Coordination of infrastructure staging to meet the land and settlement policies and actions identified in the Strategy.
- Investigate provision of alternative water yield for Singleton in the long term.
- Investigate the feasibility of supplying the villages of Jerrys Plains and Broke with reticulated sewer in the longer term.

6.5 Road hierarchy, transport links and accessibility

The Situation Analysis report identified the current situation relating to roads, transport and accessibility and noted important matters requiring consideration. While existing roads and access links are satisfactory overall, there are long term capacity limitations and measures need to be taken to support improved accessibility in the long term.

Table 6 outlines major proposals for implementation or investigation over the life of the strategy. These are shown on Map 6.3 and support the proposed long term settlement structure for Singleton as outlined in section 6.2.

The proposals identified in this section do not include consideration of a New England Highway bypass of Singleton which would significantly impact on transport and accessibility in the long term. Intersection upgrading works and other measures to improve road capacity have been separately investigate in the Singleton Traffic and Parking Study and are consistent with the proposals in the table.

Table 6: Road, transport and accessibility proposals

Proposal	Priority/Importance	Strategy
Singleton Heights Link Road (Pioneer Road extension)	High. Important to support long term future urban growth in Singleton Heights	Implement adopted Council proposal
Identify bus routes as part of future public transport strategy	Medium. Important	Identify and plan for bus routes as part of implementation of urban structure plan
Dedicated cycle and pedestrian link from Singleton Heights to Singleton via Combo Land	Medium. Important in providing alternative local transport options	Update Singleton Bike Plan
Singleton North – New England Highway Link Road to the west	Medium. Relatively high strategic importance. Provides alternative flood free link to New England Highway via Rix's Creek Lane	Investigate and determine preferred routes, and integration with potential new long term railway station location
Passenger rail service improvement	High. Important for providing long term access to Sydney and Newcastle	Investigate mechanisms to improve frequency of passenger rail services
New railway station for Singleton Heights	Low. Important for long term accessibility	Investigate suitable locations, and plan future road hierarchy to accommodate preferred site
Links to improve cycle and pedestrian movement	Medium. Important.	Update Singleton Bike Plan
Pioneer Road – Fern Gully Road Link	Low. Medium importance. Long term potential to support urban development.	Investigate possible options in medium term in conjunction with review of long term urban expansion options

Objectives – road hierarchy, transport links and accessibility (Singleton and Singleton Heights)

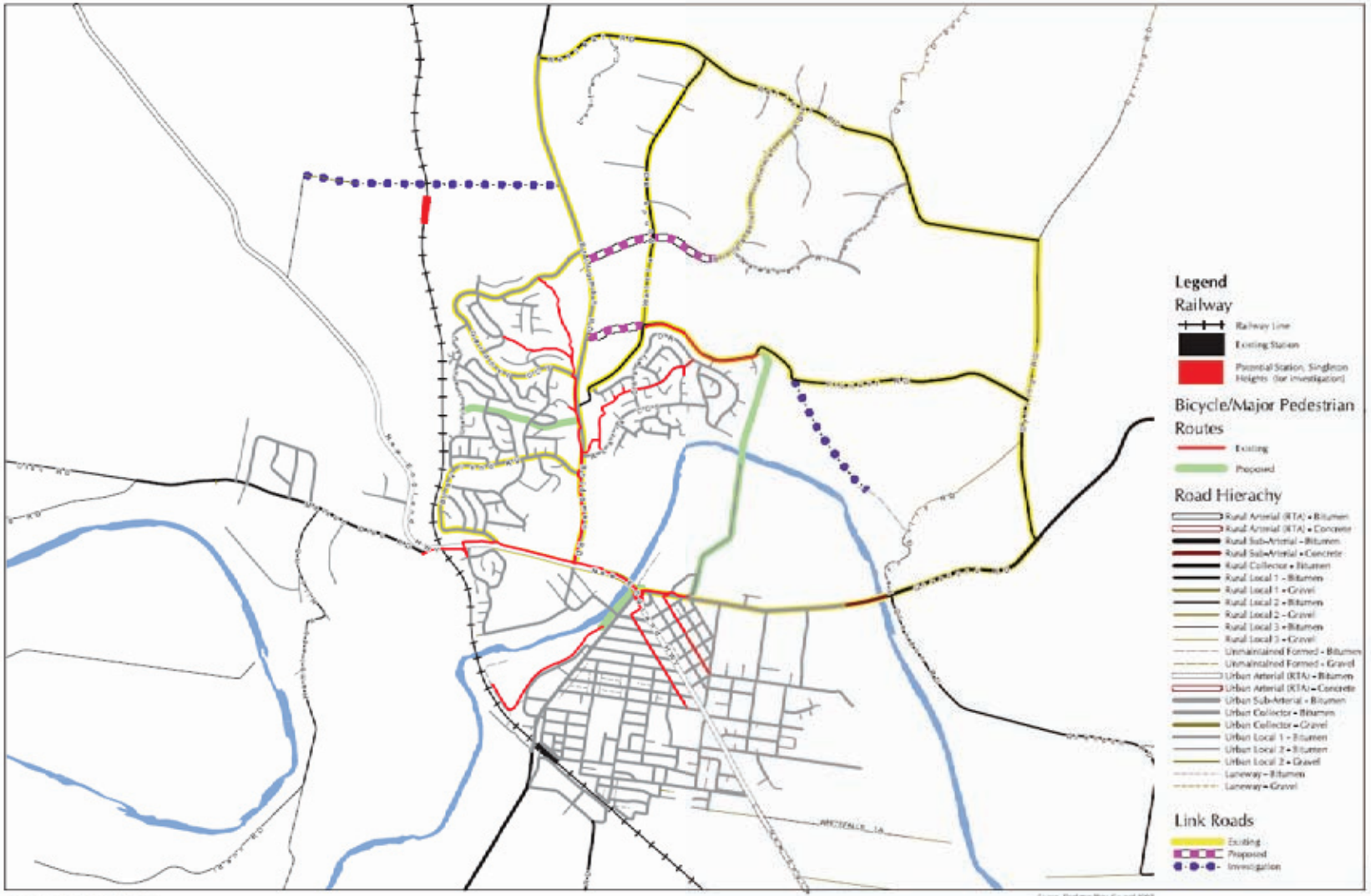
- Provide a system of roads, transport and access links to support existing and future land use and social needs.
- Ensure that access provision is economically efficient, and enables provision of public transport in the long term.
- Facilitate the provision of telecommunications infrastructure in the LGA to provide accessible, high speed communications technology.

Policies – road hierarchy, transport links and accessibility (Singleton and Singleton Heights)

- The long term transport and accessibility concepts and road hierarchy will be implemented as shown on Map 6.3.
- Implement mechanisms to ensure that costs for the provision of roads, transport and access are equitably shared by the community. Suitable mechanisms include developer contributions towards facilities using Section 94 plans or planning agreements.
- Ensure land use decisions consider and support the long term transport and accessibility concept for Singleton.
- Promote early introduction of accessible, high bandwidth telecommunications infrastructure across the LGA to facilitate economic development opportunities.

Strategic Actions – road hierarchy, transport links and accessibility (Singleton and Singleton Heights)

- Implement the road, transport and accessibility proposals outlined in Map 6.3 and Table 6.
- Recognise classified roads in the LEP map and include relevant clause (28) from Standard Instrument relating to classified roads.
- Develop principles and mechanisms for implementing transport and accessibility concepts, including funding through Section 94 contributions.
- Implement measures identified in Singleton Traffic and Parking Study.



Singleton Land Use Strategy

SINGLETON - TRANSPORT HIERARCHY AND ACCESSIBILITY

Fig 6.3

6.6 New England Highway Bypass for Singleton

Traffic volumes on the New England Highway through Singleton are increasing at a much higher rate than the rate of population growth, and are expected to continue growing with the completion of the F3 Freeway extension to Branxton. Increased traffic will affect the adequacy and safety of existing traffic arrangements within Singleton, and consequently options for a New England Highway Bypass of Singleton require consideration.

Bypass options are expected to be considered as part of the Singleton Traffic and Parking Study and Plan currently being undertaken. A highway bypass would have significant implications for future land use, and ongoing growth and development of the town.

While no routes have been determined for a possible bypass, potential options are summarised in Table 7. As a result of land use constraints, limited options are available, and all have significant engineering, economic, social and land use limitations and implications.

The benefits of determining a suitable bypass route are that provision can be made in future planning, particularly in determining the location and layout of future residential and commercial land. Future commercial and industrial development in Singleton will depend on providing certainty in relation to long term transport accessibility. Facilitating a decision on a highway bypass is therefore an important element of the Singleton Land Use Strategy.

Table 7: Potential options for Singleton highway bypass

Potential option	Comments
A Whittingham – Glenridding (From Cemetery Lane along railway to McDougalls Hill)	Shortest option. Disadvantages include engineering problems traversing major floodway, adverse impact on agricultural land, and amenity impacts to large number of existing residential properties. Requires railway overpass and Hunter River bridge.
B Western Route 1 (Mitchell Line Road, Putty Road, Hambledon Hill Road to McDougalls Hill)	Longer option, with 3km additional distance. Major benefit of route is minimal distance affected by flooding. Adverse effects on existing rural residential properties. Difficulty in route selection at McDougalls Hill due to existing development pattern. Requires relocation of Putty Road/Mitchell Line road junction and Hunter River bridge.
C Western Route 2 (Mitchell Line Road, Putty Road, Glenridding railway line to McDougalls Hill)	Longest realistic route option, with 5 km additional distance. Disadvantages include engineering problems traversing floodway and extensive flood liability. Primarily utilises existing road alignment. Relatively poor alignment, with adverse impacts on agricultural and rural residential properties as a result of development pattern. Requires relocation of Putty Road/Mitchell Line road junction and Hunter River bridge.
D Northern Route (North of existing town)	Major relocation of transport arrangements, increasing travel distance significantly. No suitable alignment apparent which would avoid conflict with potential future development.

Potential option	Comments
	Requires railway bridge and new Hunter River bridge. Most suitable route to avoid flood liable land would be via Elderslie or Belford. Not considered feasible. Requires Hunter River bridge.
E Upgrade existing alignment (New England Highway widening)	Major impacts on town amenity, and does not resolve accessibility and transport problems within Singleton. Significant adverse impact on Singleton commercial areas and residential amenity, including heritage. Retains existing problems of flood liability and traffic capacity.

Flood liability and risk is a significant cost and implication in determining the preferred route, and will be a key factor in determining a route alignment. The western routes appear to offer the most significant land use and development benefits to Singleton, and potentially provide some commercial and residential expansion opportunities that are not available with other routes.

Objectives – New England Highway Bypass for Singleton

- To ensure that regional and interstate traffic is provided with a suitable highway bypass of Singleton.
- To provide a bypass to enable improvements to road accessibility and safety within Singleton, and to maintain urban amenity.

Policies – New England Highway Bypass for Singleton

- To include highway bypass investigation routes in the Singleton Land Use Strategy concept map, and to indicate a preferred concept.
- To encourage NSW and Commonwealth Government support for the concept of a New England Highway Bypass of Singleton, and to secure necessary funding for its implementation.

Strategic Actions – New England Highway Bypass for Singleton

- To undertake a joint feasibility study of the potential route options identified, in conjunction with the NSW Roads and Traffic Authority with a view to reaching agreement on a preferred alignment.
- To provide funding for voluntary acquisition of land to facilitate the bypass.
- To recognise the preferred highway bypass alignment in the Singleton Local Environmental Plan.

6.7 Development guidelines for highway frontage land

There has been progressive land use change on highway frontage land within Singleton, and increasing demand for commercial development. Planning controls should encourage and provide for future uses which maintain the level of safety and service required of the National Highway, and accommodate adverse environmental and amenity impacts from highway traffic.

Based on current trends, it is likely that traffic volumes on the New England Highway will significantly increase in the future. An important consideration in determining the planning controls for highway frontage land will be the feasibility and timing of any highway bypass of the town. Until this matter is resolved, it is appropriate to limit further intensification of development and especially traffic generating development.

The provisions in the Standard LEP prepared by the NSW Government allow for flexible use within the R1 General Residential zone, and is the most appropriate zone for existing residential areas. An option for current commercial zones would be the B2 Local Centre zone or the B4 Mixed Use zone along some sections of the urban highway frontage.

Suitable land uses would include existing residential scale development, serviced apartments, motels, 1 - 2 storey residential flat buildings with suitable noise attenuation and traffic and parking arrangements, adaptive reuse of heritage buildings, use of existing residences for professional consulting rooms, mixed use office/residential development and community facilities.

Objectives – Development guidelines for highway frontage land

- To maintain the level of safety and service required of the National Highway, by encouraging new development which does not increase traffic demands.
- To allow new development subject to criteria which limits traffic impacts and maintains urban amenity.

Policies – Development guidelines for highway frontage land

- Maintain built form scale and character of existing highway frontage land and development by applying criteria set out in Table 8.
- Prevent adverse impacts of new development on adjacent rear residential properties (e.g. height, privacy, noise, overshadowing and other amenity impacts).
- Support consolidation of existing lots and provision of non-highway frontage road access (e.g. via side road or rear lane).
- Ensure no additional highway accesses.
- Consult with Roads and Traffic Authority in relation to new development proposals that do not meet the criteria.

- Shops or similar commercial uses should be consolidated within existing commercial zones. Highway frontage land is not recommended for bulky goods retailing or shopping centres.

Strategic Actions – Development guidelines for highway frontage land

- Develop specific DCP/development guidelines for land uses that comply with the criteria proposed in Table 8.

The following criteria (provided in Table 8 below) are proposed to be applied to determine appropriate uses for highway frontage land. Land use proposals should comply with the location and design criteria outlined. These criteria may be incorporated into LEP zone objectives or further clarified by preparing DCP guidelines and standards as appropriate. It would be appropriate to retain a residential zoning, but to allow additional uses subject to specified the criteria listed in Table 8.

Table 8: Criteria for appropriate uses for highway frontage land within Singleton

Broad Location Criteria	Comment
Water and sewer services for commercial uses over and above residential levels would be subject to availability.	Intensification of development would be limited to availability of existing public utility services.
Existing buildings or items with heritage values are to be retained.	Heritage values and the scale of development contribute to the special character and quality of the town at its entry points.
Traffic generation shall not be greater than equivalent residential use of the land unless no direct highway access can be provided (e.g. rear lane or side street).	Additional traffic generation with direct highway access is to be discouraged, to provide an incentive for alternative rear access. This results in traffic safety and management benefits.
The existing scale, character and density of development shall be generally retained.	Although desirable to maintain existing scale and character, opportunities exist for higher density and mixed use redevelopment, where this is high standard and results in other criteria being met. A general 2 storey height limit should apply. New development should not adversely affect privacy of the adjoining rear yards of residential properties by ensuring adequate design, setbacks and landscaping.
Use of land should be based on both traffic generation potential and the type of land use.	A range of small scale development types may be appropriate where these do not have high traffic generation.
Allow mixed use development which is designed to take into account sensitivity of land uses to air quality	For example, residential development may be compatible as a second storey with rear outlook above, or at the rear of ground floor small office or

Broad Location Criteria	Comment
and traffic noise impacts.	commercial space. Commercial development should not intrude into adjoining residential areas.
Large commercial and illuminated advertisements should be prohibited.	Clear advertising sign guidelines need to be developed which retain residential amenity.
Current lot sizes should not be reduced by further subdivision.	Incentives could be provided to consolidate lots to increase their size and provide greater future development opportunities.

6.8 Adequacy of land for industry and commerce, and requirements for additional land and services

Provision of adequate and appropriate industrial and commercial land is important in catering for future economic activity within the town. A number of studies have been undertaken in the past, which have been taken into account in the preparation of the Strategy, together with the response to community consultation undertaken in relation to the Situation Analysis review.

Commercial land

Commercial development in Singleton as a whole is well catered for under existing zonings. However, sectors that need consideration in future land use planning are the provision of land for bulky goods retailing, and provision for long term commercial land requirements in future urban areas in North Singleton.

Commercial land use in Singleton is concentrated within the town CBD area, with additional local shopping facilities in Singleton Heights. There is a need to provide additional local commercial areas to service future urban development in Singleton Heights, and demand exists for suitable sites with highway exposure for bulky goods retailing on larger sites.

A Review of Options for an Additional Local Retail Facility in North Singleton (Hirst Consulting Services 2007) evaluated 6 location options based on criteria including convenience, commercial attractiveness, investment optimisation, separation from CBD, site size, exposure and character. The review concluded that the only suitable sites are located along the proposed Pioneer Road link to Bridgman Road in North Singleton.

Future investigation on the suitability of, and options for, small scale non-residential facilities within the Clubhouse Precinct of the Gowrie Links Urban Release Area may occur. This will require a formal study.

Bulky goods retailing land options are extremely limited in Singleton. In the short term, this type of development can best be provided for in the Maison Dieu and McDougalls Hill Industrial Areas (an area with appropriate lot sizes and services close to the town), and in the long term by the provision of a specific bulky goods retailing

area. This will require local environmental plan provisions which support mixed use light industrial development in this specific area only. Some uses that occupy large areas of zoned commercial land in the Singleton CBD may be able to relocate to larger sites in the Maison Dieu/McDougalls Hill area. This may free up sites within the CBD and provide commercial redevelopment opportunities. A decision on the preferred long term site for bulky goods retailing development should await finalisation of the route of a future highway bypass, but would be located on the northern approach to the town. Although there has been interest in providing for this type of land on the New England Highway along the southern approaches to the town, sites in this location are not suitable, for the following reasons:

1. Adverse affect on nearby agricultural activities, noting that any development in this area will be on prime agricultural land which should not be developed.
2. The land is subject to significant flood impacts (being part of a floodway), and any development has potential to adversely affect urban areas as a result of changes to flood flows.
3. This area provides the gateway to Singleton for visitors and tourists, and it is essential to retain a high degree of amenity and rural character to be able to market Singleton as a destination with a unique and identifiable character, and as a community of excellence and sustainability.
4. Any premature development on this land has the potential to prejudice and prevent a future New England Highway bypass of Singleton.

Industrial land

The requirements for industrial land within the Singleton LGA are complex, and also require consideration within a regional context. Key elements to be considered in the Strategy are the types of industrial land and services required, existing and projected land supply and demand, the options for future provision for industry, and criteria for the location of new industrial development. The Strategy may also identify and promote employment generating activities for which Singleton is particularly suited.

Future employment generating opportunities where Singleton has locational advantages and which offer high potential to contribute to sustainable employment generation are as follows:

- Tourism
- Development related to transport infrastructure (e.g. railways and highways)
- Home based businesses and clusters
- Energy sector related
- Local and regional food processing and agriculture related (e.g. abattoir)

Regional demand for industrial land has been considered in the Lower Hunter Regional Strategy. Projected demand for general purpose industrial land needs in the Lower Hunter for the 25 years to 2031 is 825 ha and the Lower Hunter Regional Strategy states that there are currently 503 ha for the whole Lower Hunter Region. There is also around 1,200 ha of specialised industrial land available for specialised activities. Five main types of industrial land can be identified in Singleton and are summarised in Table 9.

Table 9: Industrial land types

Industrial land type	Comment
Light industrial/warehouse/bulky goods retailing (up to about 2 ha lot size)	Provided for in existing industrial areas, this comprises the predominant demand.
Large lot/heavy industrial	Generally equates to heavy industrial. Comprises uses requiring separation from other activities. Provided for in Mt Thorley Industrial Area.
Small scale, mixed use or rural industries able to be integrated with other uses (e.g. rural, residential or rural residential)	Includes transport and earthmoving, businesses, processing of rural produce, and small businesses associated with residential use or rural, with few or no non resident employees. Often conducted with no development consent or planning control.
Specialised employment areas (e.g. airport or transport related, and Macquarie Generation land)	Provide specific attributes, but are subject to limitations related to the specialised activities that can be carried out.
Adaptive reuse of sites having suitable infrastructure (e.g. former coal mines)	Have existing infrastructure (e.g. water allocation and supply), wastewater treatment, roads, rail access, electricity, etc.) and are separated from urban areas. Limited by current rural zoning.

Selmon and Broyd (2006) note that the Industrial and Commercial Lands Study of the Cessnock City Wide Settlement Strategy identifies an undersupply of light industrial land, with an additional 50 ha required to provide adequate supply for the next 15 years. Industrial land supply in Newcastle LGA is considered adequate for the short to medium term. Maitland is estimated to have industrial land supply for at least 10 years, but existing land available does not meet all demand characteristics of the market. Muswellbrook has a relatively small land supply and appears to have minor impact on demand and supply issues in Singleton LGA, with the exception of specialised industrial land opportunities around Bayswater and Liddell Power Stations.

Table 10: Summary of current zoned employment/industrial land in Singleton LGA

Name	Characteristics (total area, lot sizes, zoning and occupation)	Infrastructure limitations	Comments
Mt Thorley Industrial Area	115.2 ha zoned 4 Industrial, predominant lot sizes 0.5 to 2.0 ha, 80% of lots occupied	No sewer, water supply at capacity limits. Separated from residential uses.	Currently 20% of land is vacant, but is subject to constraints that limit development with 15.9 ha realistically available, including some large lots. Suited to heavy industrial uses and those with a mining focus
Maison Dieu Industrial Area	64.2 ha zoned 4 Industrial, with 87% occupied, no large lots with predominant sizes 0.3 to 0.5 ha	Low pressure sewer	Vacant land which could realistically be available is 6.7 ha. Site restricted to small and medium users, with no large sites
McDougall's Hill Industrial Area	53 ha zoned 4 Industrial, proposed 0.2 to 0.8 ha lot size, not subdivided or developed	Low pressure sewer	Proposed for development in near future. Some biodiversity constraints
Industrial areas in Singleton town area	Small lots zoned 4 Industrial, all occupied	Sewered	Some lots are occupied by residential uses

Source: Urbis JHD, Selmon and Broyd 2006

Selmon and Broyd (2006) suggest that there is currently about 5 years supply remaining at current development rates at Mt Thorley and Maison Dieu, plus McDougalls Hill. This study suggests planning for additional land provision of 60 ha for next 10 to 20 years. However, the industrial lands analysis prepared by Urbis JHD to support the Whittingham industrial proposal indicates that land sales and demand have been steady, with a significant rise since 2003.

Selmon and Broyd (2006) identified 3 options for provision of additional industrial land:

1. Defer until growth potential of LGA is established in Singleton Land Use Strategy (particularly considering infrastructure requirements and options and locations for industrial growth).
2. Investigation of potential for additional land at Mt Thorley for large lot industrial development.
3. Give further consideration to the Whittingham proposal, noting that this should provide for general industrial uses rather than light industrial, and that bulky goods retailing should be prohibited.

There is a high degree of uncertainty in relation to the demand for large lot medium and heavy industrial land uses. The uptake for these sites in the Hunter Employment Zone and Macquarie Generation lands has historically been very slow, and these uses typically will have a wide range of locational options, both within the region and Australia. To supply current demands, there is no immediate need to rezone further industrial land or to commit to the supply of additional infrastructure. However, the benefit of rezoning additional industrial land would be to provide a more competitive market for industrial land by increasing the number of developers, and to provide an opportunity to attract development by reason of land supply. It should be noted that this situation already exists in the Lower Hunter which currently has a supply of industrial land available, and proposals for additional rezoning of industrial lands appear likely to proceed. Accordingly, the Land Use Strategy proposes to rezone approximately 250 hectares in the Whittingham area as a "land bank" for heavy industrial purposes over a 25 year period. The rate of development of this area during the 25 year Strategy period should be staged to ensure that sequencing occurs in an orderly manner, and that adequate infrastructure such as water and sewer is available prior to subdivision and development taking place.

Proposed criteria for considering land use changes to allow new industrial areas are outlined in Table 11. These take into account the strategic principles proposed by Selmon and Broyd (2006).

Table 11: Criteria for location of additional industrial zonings

Broad location criteria
Located within or adjacent to an existing urban area (or within reasonable proximity to Singleton or Branxton) on relatively flat land which is not visually prominent.
Proximity to major transport facilities such as major roads and with railway access.
No direct access for individual industrial developments to the New England or Golden Highway, but otherwise convenient, suitable standard access.
Must have direct connection to water and sewer, provision for adequate electricity. Require water allocation and reticulated water supply and sewer for all new industrial lots.
Availability, or possible extension, of essential infrastructure such as water, sewer, electricity, sealed road access.
Must support an industrial land hierarchy, with industrial service land located close to town, and large lot industrial/mining related development separated from town.
Located so as to not have any adverse environmental impacts (e.g. visual impacts).
All large new areas for heavy industrial to be serviced by rail access.
Not subject to development constraints such as flooding, bushfire hazard, or biodiversity issues.
Access to industrial areas should avoid traversing residential areas and areas are to be accessible by public transport (if available).

Objectives – Industrial and commercial land

- Provide adequate industrial land bank to meet demand for development and enable employment opportunities.
- Provide adequate land for commercial development in Singleton in suitable locations, while maintaining compact, walkable centres.
- Encourage and support future employment generating opportunities which will contribute to sustainable employment generation.

Policies – Industrial and commercial land

- The LEP will provide adequate industrial zoned land to meet demand for development and enable employment opportunities.
- Additional land adjacent to that currently zoned for industrial purposes to be retained with planning provisions that safeguard adjacent land for prospective industrial zoning for longer term development.
- Support in-principle future heavy industrial development to be located on suitable former mine sites, where significant infrastructure already exists and/or new development can be collocated with existing mines.
- Maintain existing commercial zoned land, and strengthen the integrity of the CBD by adopting planning controls that consolidate commercial development.
- Ensure planning provisions for industrial areas do not support inappropriate commercial development, but allow bulky goods retailing in the Maison Dieu and McDougalls Hill Industrial Areas.

Strategic Actions – Industrial and commercial land

- Provide for medium/heavy industrial zonings, with up to 250 ha of additional zoned industrial land to be provided as a 25 year land bank. Staged release would be subject to demand and provision of infrastructure and services.
- Provide the additional zoned industrial land principally at the proposed Whittingham industrial site, allowing the site to be developed for heavy industrial purposes, subject to the following LEP provisions:
  - Provision and funding of reticulated water and sewer, as well as road transport infrastructure.
  - Establishment of an environmental conservation zoning to protect significant ecological areas of the site.
  - Provisions requiring the land to be directly accessible to the rail network.

    - Prohibit bulky goods retailing.
    - Prohibit light industry unless it supports or is ancillary to the medium/heavy industrial purposes.
- Apply criteria in Table 11 in considering any additional rezoning proposals for industrial purposes.
- Establish an industrial land monitor/database.
- Investigate the potential for encouraging infill development or facilitating more efficient use of existing industrial land supply.
- Undertake further assessment of the opportunities to expand the existing Mt Thorley Industrial Area.
- Initiate discussions with Rix's Creek Mine about the future of the Singleton N-W land use opportunities, primarily for large industrial sites.
- Ensure that available zoned industrial land is not in a single ownership, by enabling at least 2 development fronts.
- Consider including a specific LEP provision to allow industrial use of coal mining sites.
- Implement a Council policy or DCP for bulky goods to limit retailing in industrial areas.
- Implement LEP provisions to allow compatible home businesses in residential zones.
- Review CBD boundaries in preparation of draft LEP to ensure commercial areas are appropriately zoned and avoid oversupply of commercial zoned land. Zoned commercial land in CBD should be expanded to include Department of Housing land on southern end of Ryan Avenue (behind Franklins) and the former Telstra Depot off York Street.
- Consider 'core' and 'peripheral/supporting' commercial zones, subject to Standard LEP template.
- Implement recommended options of Hirst Consulting Services 2007 report on additional local retail facilities in North Singleton.
- Ensure the permissibility of community and cultural facilities in commercial zones.
- Encourage a compact town through infill and mixed use developments.
- Implement CBD Strategic Improvement Project through DCP provisions.

6.9 Floodplain development and management

Extensive areas of the LGA are subject to flooding, including the town of Singleton, parts of Branxton village and surrounds, Broke, Jerrys Plains and rural areas forming part of the Hunter River floodplain. The Floodplain Management Manual 2005 prepared by the NSW Government provides guidance on approaches to floodplain development and management.

The town of Singleton is economically vulnerable to flood impacts, and future new development should seek to reduce this vulnerability by measures such as restricting additional urban zoned land to flood free locations, supporting flood free road links, and limiting infill density within the flood liable areas of the existing town.

Singleton town is located on the natural flood plain. While the constructed levee system can reduce flood impacts from minor to moderate floods, it is not feasible to prevent major flood events impacting on the Singleton town area. As a consequence, the preferred strategy is to minimise further development on the floodplain to prevent impacts. Development in floodways such as at Dunolly and Glenridding is particularly vulnerable to flood impacts which cannot be mitigated except by limiting land use.

Objectives – Floodplain development and management

- To minimise development on the floodplain, especially in areas identified as of high hazard.
- To apply minimum standards to new development on flood liable land, based on the level of hazard.

Policies – Floodplain development and management

- Adopt the 1 in 100 year (1%) flood as the flood standard for Singleton LGA. New residential development and substantial extensions and alterations to existing residential development will be required to have a floor level above this standard.
- A flood hazard and management study is required prior to any future changes to land use (i.e. zoning) being considered by Council. Any study is to have regard to the above objectives.
- Prevent erection of additional new dwelling houses on the floodplain in rural areas.
- Confirm existing policy to prevent additional development at Glenridding, owing to its flood liability and hazard.

Strategic Actions – Floodplain development and management

- Consider formal adoption of the Singleton Floodplain Management Plan 2003.
- Update the Singleton Floodplain Management DCP in conjunction with the new Singleton LEP.

- Undertake data review, mapping and flood modelling to prepare more detailed spatial data showing the extent of the floodplain and estimated flood levels in rural areas of the LGA.
- Include LEP provisions to prevent development on unsuitable sites, to consider risks, and to ensure appropriate design and management.

6.10 Availability of suitable sites for future institutional use

As the population and economy in Singleton grows, it is critical for suitable land to be set aside for the needs of institutional uses, such as aged persons accommodation, health facilities and education facilities.

Key uses which may be anticipated/required as the town expands should be in appropriate locations (e.g. medical facilities, educational facilities, community facilities, nursing homes, childcare etc.). Important sites include Singleton Hospital surplus land which should be retained for institutional use.

Objectives – sites for future institutional use

- To provide suitable land for the future needs of institutional uses (e.g. aged persons accommodation, health facilities and education facilities).

Policies – sites for future institutional use

- Seek to maintain sites with a minimum area of 1 ha in suitable locations for future institutional use.
- Identify future school sites in North Singleton as a priority in the short term.

Strategic Actions – sites for future institutional use

- Reach agreement with Department of Education and Training in relation to future school site requirements in North Singleton.
- Include LEP provisions allowing integration of institutional uses.
- Identify future sites for institutional and nursing home/hostel development and maintain these at an adequate size.
- Ensure new subdivision and development proposals consider retaining suitable sites which are adaptable to a range of future purposes.

7 PROPOSED RURAL RESIDENTIAL DEVELOPMENT AND SUBDIVISION

Current villages within Singleton LGA are Broke, Bulga, Jerrys Plains and Camberwell, which are currently zoned 1(d) Rural Small Holdings under Singleton LEP 1996. There are also areas in rural locations zoned for rural residential development. Villages and rural residential areas currently zoned 1(d) have a total area of about 2,052 hectares, of which the 4 villages referred to above comprise about 30%. Villages and rural residential areas comprise around 7% of the total population of the LGA.

Apart from villages, which were created as part of historic subdivision patterns, current demand exists for two broad types of general rural residential development:

- Rural fringe, generally in estates adjacent to an urban area with services such as sealed roads, water and reticulated sewer, and lot sizes of 4,000 square metres to 2 ha (e.g. Retreat, Hambledon Hill and Branxton rural residential areas);
- Rural living lots comprising residential use within a rural environment, generally with no services and lots 2 ha or larger (e.g. 'concessional' and other lots of less than the current general 40 ha minimum area subdivided since 1966 in rural areas generally, and 1(d) zoned land at Bulga and land off Wine Country Drive south of Branxton with access through Cessnock City Council area).

Purchasers of rural lifestyle lots are seeking lifestyle rather than productive attributes of the land and are generally persons relying on employment in Singleton and adjoining LGAs, or moving from outside the area. Rural residential subdivision and land use is often considered to be in conflict with commercial agriculture, and separation from agriculture is normally desirable.

Rural residential subdivision and development is a key land use planning issue in the Singleton LGA. Demand for small rural subdivision is primarily related to road accessibility, specifically proximity to Singleton, Broke, Branxton and Maitland and to mining related employment opportunities west of Singleton. Its development can affect agricultural land uses and viability, and the provision of services and infrastructure. It can also result in a range of environmental impacts including water availability, traffic, and biodiversity impacts.

The Singleton Rural Residential Strategy has identified short term candidate areas for development and has formed the basis for the proposals in this Strategy for new areas to be identified for rural residential subdivision. As part of the community consultation undertaken in relation to the Situation Analysis, additional further areas for rezoning have also been proposed and require evaluation.

As outlined in Section 6, for planning purposes it is anticipated that around 35% of new dwellings to 2021 will be in rural areas (around 70 per year), but this proportion is substantially dependent on the provision of land for rural residential development. The current demand for rural lifestyle development suggests that demand for rural residential land will exceed supply in the short term, with little further land available under the current LEP and DCP provisions. Singleton Council (December 2005) has estimated a demand for rural residential allotments (as distinct from new dwellings) of 75 per year.

Key land use planning issues were identified in the Situation Analysis as follows:

- Provision of adequate land for rural residential development in suitable locations.
- Future use and development of villages and all 1(d) zoned land.
- Village service provision and maintenance (including roads, water, sewer, groundwater and surface water runoff).

Strategic directions for each of these issues are presented in the sections below.

Appropriate zones for rural residential purposes need to be determined, taking into account the Standard LEP requirements implemented by the Department of Planning. The available zonings need to be considered in conjunction with minimum subdivision sizes. Zone options are RU4 Rural Small Holdings (objectives mainly relate to primary production), RU5 Village (flexible zone allowing uses incompatible with existing rural residential character), R5 Large Lot Residential (primarily supports residential use), and E4 Environmental Living (for areas with special ecological, scientific or aesthetic values). The Large Lot Residential zone most closely reflects the character of most existing rural residential areas in Singleton.

7.1 Provision of adequate land for rural residential development in suitable locations

It is important to provide for certainty in relation to the location of rural residential development to prevent adverse impacts on primary production land and flow on effects of increasing land values for other rural land.

The Strategy recognises the need to provide additional land within the LGA to cater for rural residential purposes. It provides the framework for:

(1) Determining areas for further investigation and rezoning.

(2) The preferred LEP zones (Rural Small Holdings where intensive agricultural production is a key objective, Large Lot Residential, or Environmental Living).

(3) Staging of rural residential development.

(4) Providing criteria for future rezoning requests for rural residential development outside current investigation areas.

(5) Flow on DCPs and Section 94 contributions plans required following rezoning.

The Situation Analysis identified demand and supply issues and future planning options. It is important to note that the drivers of rural residential differ between

Singleton and Branxton, and development rates may vary over the life of the Strategy depending on the availability of suitable land supply.

The Strategy determines what additional areas should be zoned for rural residential development, and the infrastructure servicing requirements for these areas. The proposed areas for rural residential development are shown on Maps 7.1A and 7.1B and in Table 12. These are based on the *Singleton Rural Residential Development Strategy 2005* and subsequent agreements between the Council and the Department of Planning. Based on the estimates in this table, there is a potential yield of 670 lots within these candidate areas, which would provide for just under 10 years demand based on 75 rural residential lots per year.

There is potential for expansion of the identified candidate areas, or for increasing the subdivision density to increase lot numbers. On this basis the Council would not need to consider additional candidate areas for rural residential development over the life of the Strategy.

The objectives, policies and strategic actions for rural residential development in Singleton LGA are as outlined below. This section includes infrastructure provision guidelines for new rural residential areas.

Table 12: Proposed candidate areas – rural residential

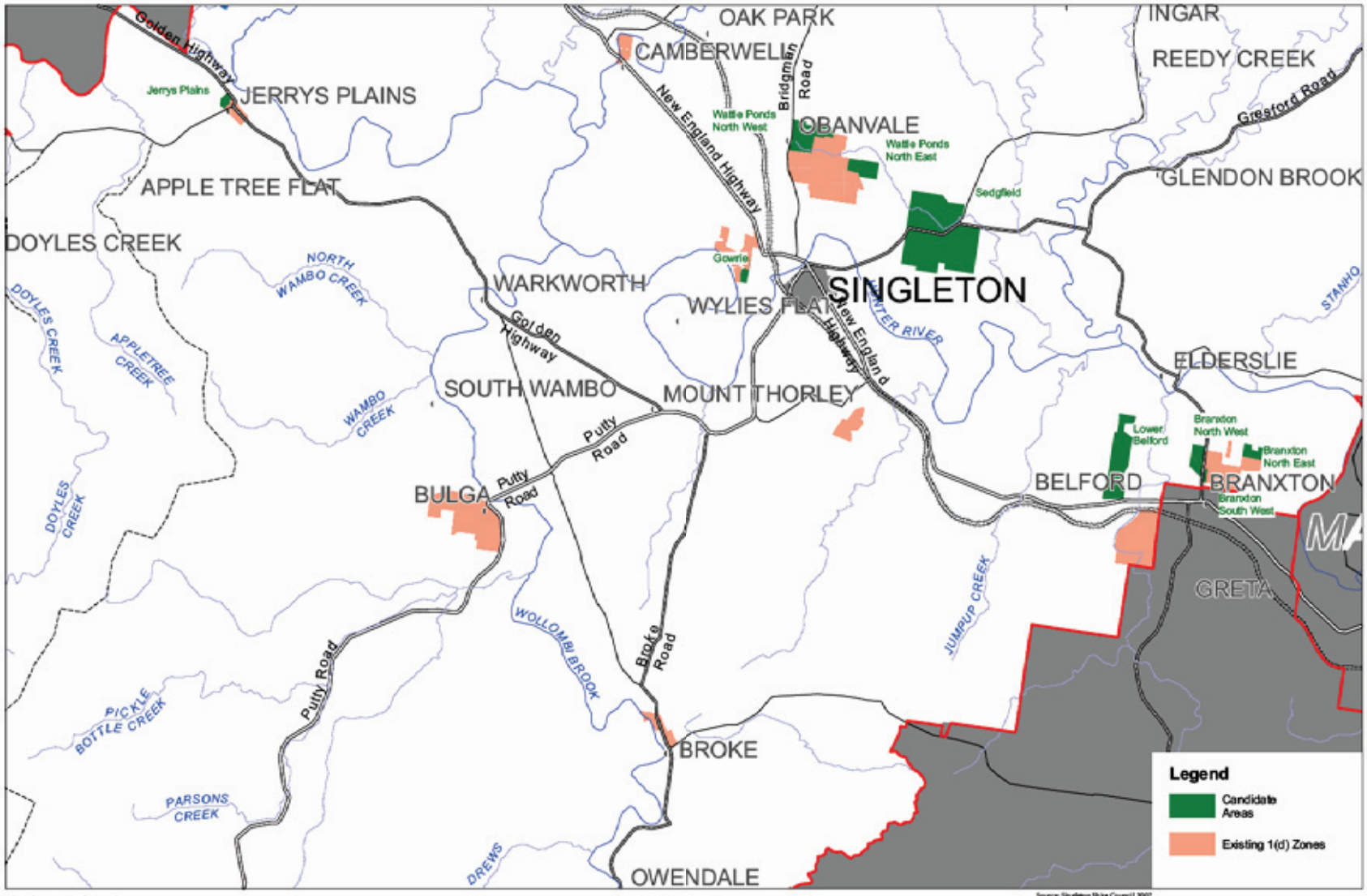
Candidate areas	Description
Lower Belford	Total area 277 ha in 17 existing lots. Proposed zoning Environmental Living, minimum average subdivision area 5 ha. Maximum potential approximately 30 lots. Potential occurrence of listed endangered ecological community requires detailed ecological investigation. Within proposed extension of Hunter Water Corporation service area and subject to service agreement. Consideration should be given to lower minimum lot size and potential reticulated water servicing, which would increase lot yield.
Jerrys Plains	Total area 20 ha. Proposed zoning Large Lot Residential, with minimum average subdivision area of 1 ha. Reticulated water available. Maximum potential 17 lots. Potential occurrence of nationally listed endangered ecological population may require detailed ecological investigation.
Wattle Ponds North East	Total area 88 ha in 4 existing lots. Proposed zoning Large Lot Residential, with minimum average subdivision area of 1 ha. Reticulated water to be provided. Maximum potential approximately 70 lots.
Wattle Ponds North West	Total area is 167 ha in 8 existing parcels. Proposed zoning Large Lot Residential, with minimum average area of 1 ha. Reticulated water to be provided. Maximum potential approximately 134 lots.
Sedgefield	Total area is 922 ha in 57 existing lots. Proposed zoning Environmental Living, minimum average area 5 ha. Maximum potential approx. 100 lots. Reticulated water not available. Rezoning should not progress until master planning of the area,

Candidate areas	Description
	required by DoP, is completed.
Gowrie	Total area 18 ha in 2 existing lots. Proposed zoning Large Lot Residential, with minimum average subdivision area of 4,000m^2 with reticulated water and sewerage provided. Maximum potential approximately 35 lots.
Branxton North West	Total area 88 ha in 7 existing lots. Proposed zoning Large Lot Residential, with minimum average subdivision area of 4,000m^2 (if sewer available). Full urban services required to be provided subject to service agreement with Hunter Water Corporation. Potential occurrence of listed endangered ecological community requires detailed ecological investigation. Maximum potential approximately 180 lots. Land adjoining to the south may have potential for rezoning to "Environmental Living" to provide a transition to agricultural lands.
Branxton North East	Total area 41 ha in 5 existing lots. Proposed zoning Large Lot Residential, with minimum average subdivision area of 4,000m^2 (if sewer available). Full urban services required to be provided subject to service agreement with Hunter Water Corporation. Maximum potential approximately 87 lots. Potential occurrence of listed endangered ecological community requires detailed ecological investigation.
Branxton South West	Total area 8 ha in 8 existing lots. Proposed zoning Large Lot Residential, with minimum average subdivision area of 4,000m^2. Full urban services required to be provided subject to service agreement with Hunter Water Corporation. Maximum potential approximately 17 lots. Potential occurrence of listed endangered ecological community requires detailed ecological investigation.

Objectives – Rural residential development

- Provide opportunities for additional rural residential subdivision and development in suitable locations, and enable a range of different types of rural residential development.
- Ensure that adequate services are available for rural residential lots.
- Ensure that the supply of zoned rural residential land does not unreasonably exceed demand.
- Apply criteria to identify the best location for rural residential estates and balance socio-economic goals associated with new rural residential development with the need to preserve areas of high agricultural, scenic or environmental value.
- Identify appropriate development controls for rural residential areas through DCP provisions.

- Provide for a supply of up to 75 rural residential lots per year split 60/40% between Singleton fringe and Branxton.
- Zone adequate land for between 5 and 10 years supply (i.e. up to 400 lots around Singleton and 350 lots around Branxton), with review of land supply being undertaken every 3 years.
- New rural residential areas must relate to the long term preferred settlement structure (i.e. not be located on land with potential for urban development in the long term – 50 year + time frame), and provide adequate transport accessibility.
- The staging and sequencing of new rural residential areas shall be dependent upon the provision of adequate water supply, reticulated sewer (smaller lots less than 8,000m^2) and other infrastructure such as electricity, telecommunications and bush fire services.
- Consolidate further rural residential development of this type of land use in only two locations for each locality within the LGA, so that further services are potentially economic to provide in the long term if sufficient demand exists (i.e. do not disperse areas).
- Propose additional LEP objectives for rural residential under the proposed Standard LEP zoning provisions.
- No rezonings for rural residential in identified constraint areas (use map layers as an overlay for LEP).
- All rural residential development should have a good quality and secure water supply.
- Smaller lots (less than 8,000m^2) shall have reticulated sewer provided.
- Biodiversity and water and sewer infrastructure reviews be undertaken prior to determining final zoning boundaries and minimum lot sizes.
- Subdivision for the purposes of rural residential development should be undertaken in a manner that will not increase the potential for water extraction from streams or groundwater and comply with harvestable water rights requirements.



Singleton Land Use Strategy

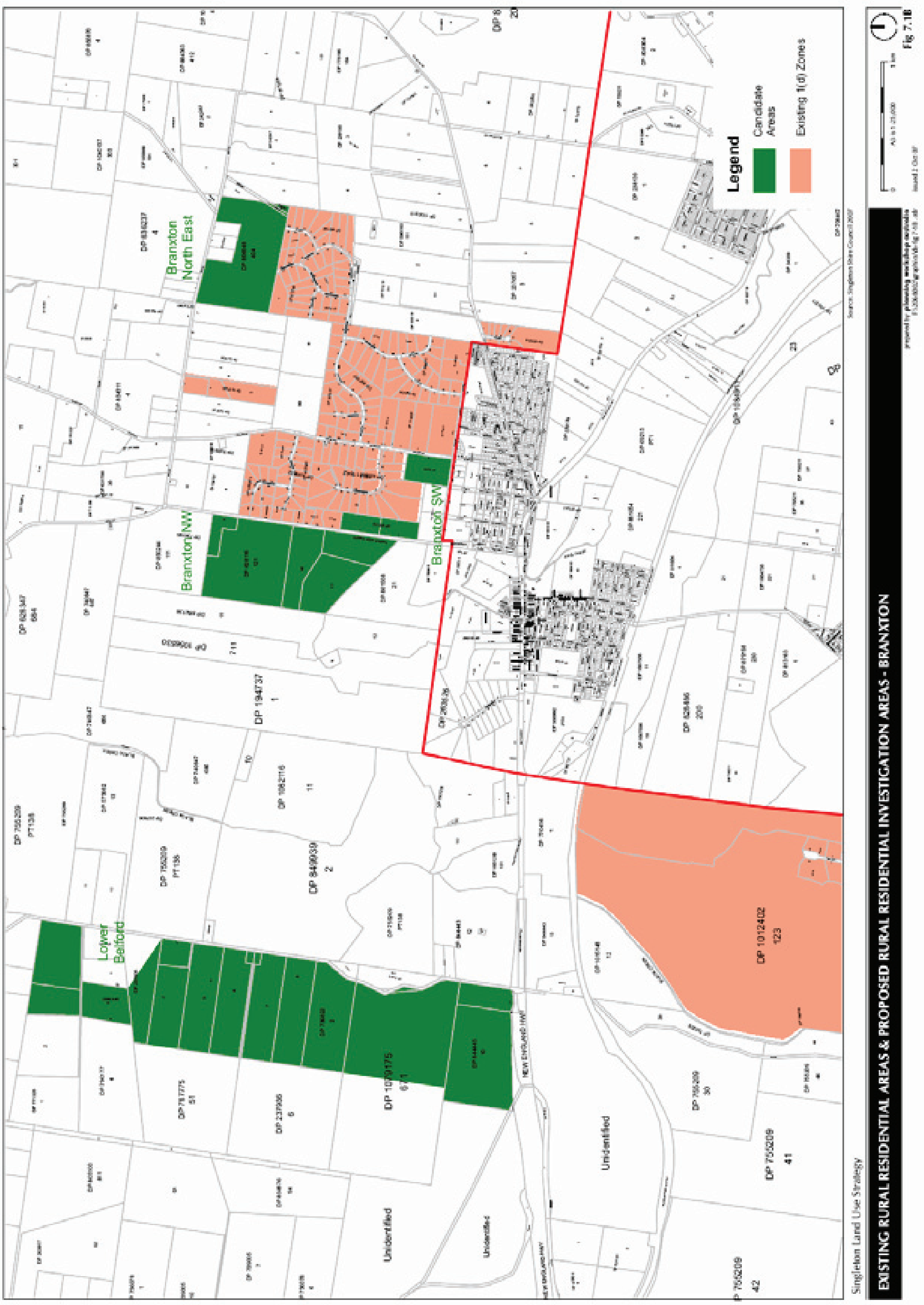
EXISTING RURAL RESIDENTIAL AREAS & PROPOSED RURAL RESIDENTIAL INVESTIGATION AREAS - SINGLETON LGA

Source: Singleton Shire Council 2007

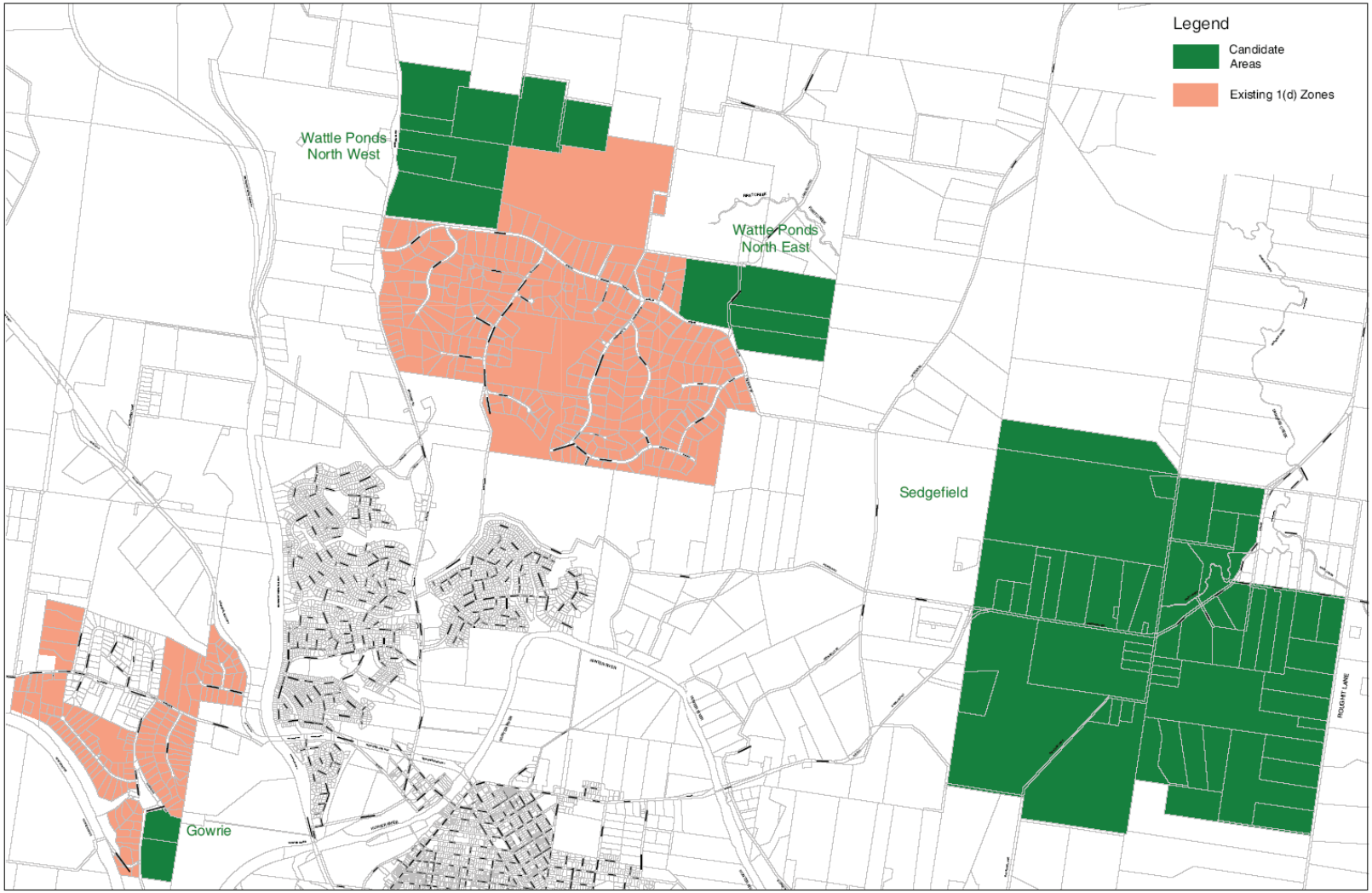
prepared by planning workshop australia

Issued 2 Oct 07

Fig 7.1A



EXISTING RURAL RESIDENTIAL AREAS & PROPOSED RURAL RESIDENTIAL INVESTIGATION AREAS - BRANXTON
Singleton Land Use Strategy
Legend
Candidate Areas
Existing 1(d) Zones
Branxton North East
Branxton NW
Branxton SW
Lower Belford
Unidentified
DP 1012402
123
DP 194737
1
DP 849939
2
DP 755209
41



Source: Singleton Shire Council 2007

Singleton Land Use Strategy

EXISTING RURAL RESIDENTIAL AREAS & PROPOSED RURAL RESIDENTIAL INVESTIGATION AREAS - SINGLETON

prepared by **planning workshop australia**
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issued 2 Oct 07

Fig 7.1C

The following criteria (provided in Table 13) have been used to identify potential land for rural residential development under the Strategy. The application of these criteria satisfies requirements identified by the Department of Primary Industries for a strategy for rural residential development.

Table 13: Criteria used in identifying potential rural residential land

Broad Location Criteria	Comment
Distance from town	Land should be within a reasonable travel distance/time from the centre of an urban area (e.g. 10 km or 15 minutes from centre of Singleton or Branxton).
Provision of services	Ability to provide reticulated water, sewer, electricity, telecommunications, bush fire services should be considered.
Location	Avoid 'stand-alone' rural residential development unless it is a logical extension of an existing significant rural residential subdivision area that will contribute to achieving a critical mass to support basic services.
Capacity for onsite water storage	This relates to the ability to have supplementary dam water supplies. Additional dam storage may not be feasible due to water resource limits and harvestable water rights.
Minimal impact on existing infrastructure	Sufficient reserve capacity should exist in power, school bus and telecommunications services.
Good sealed road access	Efficient use needs to be made of the existing road network. In general, this is relatively lightly trafficked apart from the New England Highway and some major roads leading to Singleton.
Exclude environmentally sensitive land	This land often has good visual outlooks, vegetation and privacy, all of which are in demand.
Exclude areas of high bushfire hazard	Vegetated land is in demand, but is subject to bushfire hazard constraints.
Exclude known mineral and extractive resources	Includes appropriate buffers to extractive and other non-compatible land uses.
Exclude areas near non-compatible land uses	Includes appropriate buffers to uses such as sewerage treatment works, etc.
Exclude water supply catchment land	This issue predominantly relates to avoiding contamination from onsite treatment systems, but may also relate to water access rights and usage.
Avoid areas with threatened species or	Remaining areas of native vegetation are expected to have biodiversity and ecological values. Presence of endangered ecological communities and threatened species needs

Broad Location Criteria	Comment
EECs	identification.
Avoid areas with high soil erosion risk	Primarily relates to steeper lands, and land with soil characteristics that make it more prone to erosion.
Avoid forestry land and contaminated land	Relates generally to former orchard areas, stock dip areas, and areas with identified forestry resources.
Avoid saline land and areas with soils unsuitable for onsite effluent disposal	Although not an absolute constraint, development of these lands would require reticulated sewer or alternative on site effluent treatment systems.
Avoid flood prone land	Acceptable only if flood free access and building sites/waste disposal areas are available.
Avoid Aboriginal and European heritage areas and sites	Examples include the curtilage surrounding historic dwellings.
Avoid areas with high groundwater tables	Potential problems with on site wastewater disposal, and salinity.
Avoid land with slopes greater than 18 degrees	Increased erosion potential, including from vehicle access.

Strategic Actions – Rural residential development

- Rural residential around Singleton must ensure that future urban growth options are not constrained by rural residential development, and that the road hierarchy allows flexibility for future growth of the town (e.g. maintains options for highway bypass and link roads).
- Determine arrangements with Hunter Water Corporation for provision of water and sewer to service all Branxton Rural residential areas, and Lower Belford candidate area.
- With Cessnock City Council and DoP, review the need for further areas for urban expansion within Singleton LGA adjacent to the Branxton urban area prior to rezoning any additional land for rural residential purposes.
- Adopt criteria for considering further applications for rural residential areas that are not in the currently identified candidate areas (as outlined in Table 13).

- Prepare Section 94 Contributions Plans prior to gazettal of LEP providing for additional rural residential land.
- Establish a land monitor to review rural residential supply and demand, dwelling and subdivision approvals. This monitor represents a compilation of subdivision and development approvals, dwelling completions, land releases and land sales within the rural residential candidate areas.
- Consider sunset clause provisions for rural residential zoned areas. Will prevent long term vacant developable land around villages and urban areas which may hinder future land use options, and also promotes supply of developed land.
- Maintain existing development limits within Village of Camberwell (as per existing Clause 19).
- Consider both minimum and average lot size (and possibly maximum) as a requirement. Allows for more flexible design to reflect environmental and planning constraints.
- Relate minimum subdivision size to servicing and to soil capacity for onsite disposal.
- Ensure appropriate minimum areas for onsite disposal depending upon soil type, slope, proximity to watercourse, and amount of effluent likely to be generated.
- Avoid reliance on groundwater sources as the primary water supply for rural industry or potable uses for dwellings.
- Ensure adequate water supply for fire fighting by way of dams and 20,000 litres minimum dedicated supply for this purpose.
- Consider the following LEP zones and minimum lot sizes for rural residential development:
    - R5 Large Lot Residential where town water is provided, with two minimum average lot sizes (indicated on the lot size map), being 4,000m^2 where both sewer and water are provided, and 1 ha where water only is provided. The absolute minimum lot sizes for these areas being 2,000m^2 and 8,000m^2 respectively.
    - Use of RU5 Village zone is not proposed.
    - Large unserviced rural residential lots (4 ha minimum with 5 ha minimum average) could be an E4 Environmental Living zone, although in most cases provision of services is preferable taking into account the criteria in Table 13.
- Prepare a DCP to identify appropriate sequencing of rural residential development and associated road, water, sewer, electricity, and telecommunications infrastructure. Subdivision layout is to be master planned and investigation made to create

certainty for future residents by use of the LEP Lot Size Map provisions of the Standard Instrument.

7.2 Future use and development of existing villages and all existing 1(d) zoned land

This section addresses the development potential and future zoning of existing rural villages and other existing 1(d) zoned land. There are 9 distinct areas currently zoned 1(d) Rural Small Holdings under Singleton LEP 1996.

The villages of Broke, Bulga, Jerrys Plains and Camberwell villages have individual character and planning issues, and provide alternative residential opportunities to larger urban areas. Villages currently have minimal infrastructure services and historic subdivision patterns with not all lots having a dwelling entitlement under the current planning controls. Section 7.3 reviews infrastructure service provision for these areas.

Other areas currently zoned 1(d) are primarily rural residential subdivisions approved by Singleton Council.

An analysis of lot availability and demand undertaken by Singleton Council (December 2005) found that existing 1(d) zones have little potential to provide further rural residential lots to meet anticipated demands based on historic trends. This analysis assumed that lots of less than 5 ha are unlikely to be developed, notwithstanding the existing LEP minimum subdivision area within 1(d) zones of 1 ha. This was largely due to native vegetation and topographic constraints. The situation for each of the existing zoned areas is summarised in Table 14 and these are shown on Map 7.1.

Table 14: Situation for existing villages and existing 1(d) zoned land

Village or area	Description
Camberwell	Special provisions apply in current LEP (Clause 19) which should be continued. No significant development potential, subject to coal mining impacts.
Jerrys Plains	No significant development potential, subject to possible future coal mining impacts. Potential infill development. Reticulated water supply provided.
Broke	No significant development potential, parts are subject to flooding. Reticulated water supply provided.
Bulga	No significant development potential due to development constraints. Generally has rural small holding character, rather than residential. Environmental Living zone appropriate.
Whittingham	Unlikely to yield significant new infill lots. Currently serviced by low pressure water supply at limit of capacity. Environmental Living zone appropriate.
Branxton	Serviced by Hunter Water Corporation reticulated water supply and pump out sewer system, but no further pump out systems will be approved. Potential for an additional 6 to 15 lots.
Hanwood Estate	Subject to significant development constraints, and unlikely to be

Village or area	Description
	further developed in short term. Included in urban investigation area under Lower Hunter Regional Strategy. Under current planning controls there is potential for an additional 310 rural residential lots to be subdivided.
North West Singleton	Potential for up to 5 additional lots. Subject to servicing constraints, and close proximity to industrial area.
Retreat	Potential for around 50 additional lots.

The following objectives, policies and strategic actions are derived from the Situation Analysis. Strategic directions for issues are presented in the sections below. Future LEP provisions (including zoning) are proposed for existing 1(d) zoned land, and infill or additional development potential should be considered in villages.

Objectives – Development of villages and existing 1(d) zoned land

- Generally retain existing subdivision and development provisions for existing 1(d) zoned land, within the framework provided by the Standard LEP. Provide for 1 ha minimum average lot size and 4,000m^2 minimum average if sewered.
- Review options for infill and consolidation of existing areas (except Camberwell).

Policies – Development of villages and existing 1(d) zoned land

- Review options for consolidating additional rural residential development within existing zones to facilitate more efficient infrastructure utilisation.
- Maintain and enhance the distinctive character and landscape setting of existing villages, and ensure that the character of villages is identified in DCP or LEP supplementary objectives.
- Prepare draft outline for the security of villages from further underground and open cut mining with an emphasis on a buffer zone and the way forward for growth for these villages.
- Seek to maintain or encourage at least two development options in terms of land ownership for each rural residential area where growth is anticipated and provided for.
- Put in place strong controls on incompatible land uses in rural residential zones, including the use of supplementary objectives.
- Minimum lot sizes for each village are to take into account existing lots, character requirements, on-site wastewater servicing requirements, and separation distances from existing dwellings.

Strategic Actions – Development of villages and 1(d) zoned land

- Zone existing 1(d) zones (except Bulga and Whittingham) R5 Large Lot Residential. Retain current 8,000m² minimum subdivision area but implement a 1 ha minimum average.
- Zone Bulga and Whittingham 1(d) zones E4 Environmental Living with 4 ha minimum subdivision area and 5 ha minimum average.
- Update DCPs to reflect updated LEP provisions.

7.3 Village service provision and maintenance (including roads, water, sewer, groundwater and surface water runoff)

This section addresses the infrastructure capacity and maintenance of the rural villages of Broke, Bulga, Jerrys Plains and Camberwell. A review of infrastructure issues relating to each of the villages within the LGA was included in the Situation Analysis report (Table 69).

The Village of Broke is being provided with a reticulated water supply, and is the only village where substantial demand for additional development could be anticipated. There is currently minimal land available for subdivision at Bulga under current LEP and DCP provisions. Further development at Camberwell is restricted by LEP provisions, and historic trends show little demand for new development at Jerrys Plains.

Objectives – Village service provision and maintenance

- Provision of limited urban services within villages (e.g. water, and waste) where demand for growth is identified and service provision is economic.

Policies – Village service provision and maintenance

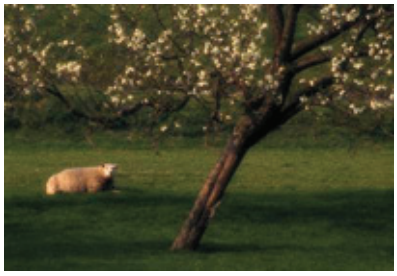
- Reticulated water is available to Broke and Jerrys Plains, but not Bulga, Camberwell or any other village type areas.
- Reticulated sewer will not be provided to any village, and minimum lot sizes for subdivision and construction of dwelling houses is to be based on on-site wastewater disposal requirements.

Strategic Actions – Village service provision and maintenance

- Review potential for further development at Broke and current Section 94 contributions plan provisions.
- Maintain current level of development potential in LEP provisions for all villages to relate to service provision.

8 RURAL AREAS

Agriculture is one of the main rural land uses within Singleton LGA and continues to significantly contribute to local economic activity. The main agricultural activities are beef cattle grazing, dairying, viticulture, horticulture and equine activities. Singleton has substantial alluvial areas with high levels of agricultural productivity, with 2% of the LGA (over 8,500 ha) identified as Class 1 agricultural suitability. This land is significant at a regional and state level.



The 2001 ABS agricultural census indicates that the economic value of agriculture for the year was $34 million and there were around 600 producers. Average farm size for the Singleton LGA in 2001 was estimated at 356 ha and has been declining, and the total number of farms has been increasing. This does not take into account small holdings on which there is limited agricultural production.

A significant proportion of the LGA is used for coal mining or part of mining company land holdings, predominantly in the Rural West Planning Area. There are land use issues related to the impact of transport of coal and road access, as well as mining impacts on surrounding land and the need for appropriate buffers. Coal mining production and employment are expected to be stable or increase during the period of the Strategy.

The Singleton Military Area comprises an area of about 12,500 ha south of the town. This houses the Infantry Centre and other units, and provides economic benefits. There are also potential adverse impacts on land surrounding this area, primarily from noise and vibration.

Rural tourism is increasingly significant in Singleton LGA, with pressure for diversified tourism development particularly in vineyard areas (e.g. Hermitage Road and Broke Fordwich). Vineyards have a high agricultural and tourism value. There is a range of potential land use conflicts relating to agricultural use and impacts, development potential for dwellings, traffic impacts, scenic amenity and commercial activities in rural areas. Future planning should take these issues into account.

Key land use planning issues for the rural areas of Singleton were identified in the Situation Analysis as follows:

- Minimum rural subdivision size
- Protection of agricultural land and viability
- Coal mining lands and buffers
- Defence lands and buffers

- Climate change implications for land use
- Rural water quality and availability and protection of catchments and resources
- Rural servicing costs and requirements
- Branxton-Whittingham corridor development options

Each of these issues is presented below. In addition, the *Central West Rural Lands Inquiry* conducted for the Minister for Planning and concluded in August 2007 has potentially significant impacts for rural planning in NSW. The findings of the Inquiry are discussed in Section 8.9.

8.1 Minimum rural subdivision size

Singleton Council has a significant regulatory influence over future rural land use through controls over the subdivision of rural land. The Strategy and subsequent local environmental plan identify the requirements that will apply to future rural subdivision. Minimum subdivision size affects agricultural viability, enables effective provision of infrastructure servicing, and prevents land use conflicts which may arise from allowing residential uses on small lots in rural areas. Other provisions relating to maintaining and protecting agriculture within the LGA are referred to in Section 8.2.

The demand for rural subdivision is primarily affected by the dwelling entitlement on subdivided lots. Although planning provisions in the LEP could separate dwelling entitlements from lot sizes, the Strategy does not propose this. Proposed minimum rural lot sizes will generally retain existing character and entitlements, with the objective of ensuring that LEP subdivision provisions will be unlikely to change land use significantly.

A minimum area of 150 ha is proposed for the Rural North and Rural West planning areas where the predominant land use is grazing and where larger holdings are common. This is anticipated to have the effect of supporting the retention of commercial grazing activities. In parts of the LGA where the predominant land use is other than grazing and where lot sizes are less than this already, the 40 ha minimum should be retained (e.g. parts of the Rural South, Rural South East and Rural East planning areas).

The standard local environmental plan provisions include a primary production zone, within which a range of minimum lot sizes can apply. The NSW Department of Planning has developed a methodology for determining rural lot sizes which is substantially based on Department of Primary Industries methodology, but which is not readily applicable to the range of land use and existing subdivision pattern within the Singleton LGA. The Department of Primary Industries has indicated a preference for a minimum 150 ha property size to enable effective cattle grazing enterprises in the Hunter Valley which may be considered in determining minimum subdivision area where grazing is a predominant agricultural use.

LEP provisions could provide for a rural small holdings zone, permitting smaller subdivision sizes with the objective of providing for agricultural production. Holdings analysis within selected areas of Singleton LGA shows that there are enough small lots currently in existence to provide for this purpose, and no specifically identified rural small holding areas should be identified for agricultural purposes. Future

investigation may be warranted in the medium term (e.g. in vineyard areas) but water is a significant limitation and at the present time a specific provision cannot be justified. Holding the current 40 ha minimum area in areas with rural small holding potential provides adequate opportunities and prevents land values increasing due to speculation that may occur with such a zone.

Objectives – Minimum rural subdivision size

- Minimum rural subdivision sizes within Singleton LGA will be of sufficient size to accommodate and maintain a range of commercial agricultural production (predominantly grazing enterprises).
- Minimum allotment sizes will take into account land capability and agricultural suitability.

Policies – Minimum rural subdivision size

- LEP provisions for subdivision of rural land should reflect land use capability and the requirements for maintaining commercial agriculture.
- minimum lot sizes (with a dwelling entitlement) are to reflect broad scale land capability/suitability.
- Additional rural subdivision should ensure that adequate infrastructure and services are provided to new lots (including roads, electricity and telecommunications).
- The retention of 'concessional allotments' allowing subdivision of land less than the general minimum area is not supported, recognising that these have resulted in rural residential development in inappropriate locations.
- Adopt a differential minimum rural lot size within the LGA based on predominant land use and existing subdivision pattern.
- New subdivision is not to result in the creation of a right or expectation of additional water rights (e.g. by ensuring no creation of additional lots with river frontage, requiring onsite water provision, or by prior purchase of water entitlement).
- Farm or property management plans should be recognised as an LEP consideration in determining rural subdivision requirements.
- Recognise that production systems now often utilise multiple properties when setting minimum lot sizes.

Strategic Actions – Minimum rural subdivision size

- Consider the following minimum rural lot sizes (with input from DPI):
    - general minimum 40 hectares throughout rural areas of LGA (except where the predominant land use is grazing

on larger holdings and/or mining, and/or the retention of existing land use and subdivision pattern is desirable);

- broad acre grazing, 150 hectares in those parts of LGA where there is currently a predominant rural subdivision size of greater than 40 ha and/or where retention of existing land use and subdivision pattern is desirable (e.g. Rural North and Rural West planning areas).

- Consider permitting agricultural subdivision to occur without dwelling rights or without minimum lot sizes. Could be linked to consolidations, boundary adjustments, property management plans, etc.
- Consider smaller minimum subdivision areas for horticultural areas on an individual basis, where the land use is established prior to subdivision.
- Consider a farm adjustment clause (as per standard LEP).

8.2 Protection of agricultural land and viability

Significant employment in the LGA is generated by agriculture and related activities. Tourism in agricultural areas is also economically important, and needs to be taken into account and provided for. The importance of maintaining commercial agriculture is essential from both an economic and environmental point of view, and has been particularly emphasised by the NSW Department of Primary Industries.

Important ways in which the Strategy and LEP can influence agriculture are in determining suitable locations for rural residential subdivision and development; supporting the provision or improvement of infrastructure (such as roads or telecommunications); specifying minimum sizes for subdivision of rural land (dealt with in Section 8.1) and the erection of dwellings, affecting the permissibility of agriculture-related activities (e.g. rural worker dwellings, sheds and buildings, farm based industries, etc.); and restriction of uses that may be incompatible with agriculture. The most significant mechanisms relate to separation of rural subdivision entitlements from dwelling entitlements, zoning (including whether there should be more than one rural zone), permissible uses within the zone and exempt and complying development.

Certain measures proposed in the Hunter-Central Rivers Catchment Action Plan to support agricultural land use, and improved environmental management practices may be able to be linked to the Strategy and LEP.

Objectives – Protection of agricultural land and viability

- The Singleton LGA will have agricultural land that:
  - Is sufficient in size and quality to accommodate and maintain a range of commercial agricultural production in accordance with land capability and suitability.
  - Maintains a significant share of the local labour force.

- Rural production areas will be clearly identified by LEP zoning and uses in rural areas should be compatible with agricultural production.
- Other environmental values in rural areas which support agriculture should be maintained (including protection of biodiversity and natural ecosystems, rural landscapes, and water quality).

Policies – Protection of agricultural land and viability

- Recognise catchment management authority catchment action plan objectives and priorities as a matter of consideration in LEP provisions.
- Ensure water availability is considered in new development proposals and that adequate supplies are maintained for existing agriculture.
- Rural residential areas will be clearly identified and separated from rural production areas to reduce potential land use conflicts.

Strategic Actions – Protection of agricultural land and viability

- Consider using RU1 Primary Production, RU2 Rural Landscape, and E3 Environmental Management zones in the LEP (These zones are from the DoP Standard LEP provisions).
- Ensure that water supply for non-residential rural development is appropriately considered, including necessary water licences and appropriateness of ground water usage.
- Introduce LEP provisions to ensure that incompatible land uses and activities in agricultural zones are not permitted.
- In conjunction with the CMA, implement performance-based outcomes for the quality of water being discharged.
- In conjunction with the CMA & DPI, develop a framework for requiring farm and property management plans to address water quality and availability.
- Develop policies for dwellings erected in conjunction with intensive agricultural production.
- Review zoning options to enable diversified tourism and accommodation, especially in the Hermitage Road and Broke Fordwich areas.

8.3 Coal mining lands and buffers

Coal mining is probably the most significant land use and economic activity affecting the future of the LGA. In Singleton, coal production and employment is reaching its expected peak, and is likely to be stable or increase for the next 10 – 15 years and then progressively decline as easily accessible coal resources are depleted.

Within the LGA, coal mining directly employed about 4,000 persons in 2004 and produced about 52 million tonnes of coal. Mining has a range of environmental and social impacts which need to be taken into account in future land use planning.

Objectives – Coal mining lands and buffers

- Recognise that coal mining will remain a major land use within the Singleton LGA for the foreseeable future, especially in the Rural West planning area.
- Ensure that incompatible land uses are not permitted within coal mining areas, and appropriate buffers to protect environmental amenity are applied.

Policies – Coal mining lands and buffers

- Recognise that coal mining will remain a major land use within the Singleton LGA for the foreseeable future, especially in the Rural West planning area.
- Ensure that incompatible land uses are not permitted within coal mining areas, and appropriate buffers to protect the environmental amenity of adjacent uses are applied.
- Ensure that the environmental impact of new coal mining developments is to be fully assessed, including the planning context and regional scale impacts (especially relating to water, air quality and biodiversity).

Strategic Actions – Coal mining lands and buffers

- LEP to include objectives for coal mining, provide for mining as a permitted use in rural zones, and contain principles and criteria for the development of coal mining proposals.
- Support a strategic review by the NSW Government of future coal mining proposals within the Upper Hunter Region, including rehabilitation, infrastructure and land use options, and an update of the DPI (Minerals) Synoptic Plan for rehabilitation of mined landscapes.

8.4 Defence lands and buffers

The Singleton Military Area comprises an area of about 12,500 ha and is an important Army training facility. The area is a major land use and contributes substantially to the Singleton economy. Activities within the area include a live firing range, which may periodically result in noise and vibration impacts on land in the vicinity.

Objectives – Defence lands and buffers

- Recognise Defence lands as an important land use within the LGA and provide adequate buffers to surrounding land uses to maintain environmental amenity.

Policies – Defence lands and buffers

- Consult with Defence in relation to future land use change and major development proposals in the vicinity of the Singleton Military Area.

Strategic Actions – Defence lands and buffers

- Consider LEP provisions and/or overlay map to require consideration of noise and vibration impacts on land uses in the vicinity of the Singleton Military Area.
- Consider identifying principles for the use of lands around the perimeter of the Singleton Military Area, for inclusion in DCP provisions.

8.5 Climate change implications for land use

Climate change has potentially significant implications for water supply, agriculture and rural land use generally in the medium term. It also has significant implications for urban land use. There is a long term likelihood of greater frequency of extreme events (affecting natural hazards such as bush fires and flooding), increasing temperatures, evaporation, and potential changes in seasonal patterns.

Climate change is expected to have implications for agricultural viability. The three major implications of climate change for agriculture will be change to the growing season (and number of frosts), the impacts on the availability of water (including total rainfall and higher evaporation), and lower predictability of climate. A longer growing season and higher temperatures may benefit the introduction of new crops, while lower effective water availability may increase the frequency of drought conditions.

Climate change predictions indicate that there may be opportunities for new types of enterprises in the future, and that rural subdivision policy should seek to protect current water entitlements and availability.

Objectives – Climate change implications for rural land use

- Take into account the best available information on climate change scenarios for Singleton in making strategic land use decisions, especially for uses with sensitivity to climate change.

Policies – Climate change implications for rural land use

- Review impacts of climate change on water supply and security.

- Review responses to climate change periodically as further information becomes available.

Strategic Actions – Climate change implications for rural land use

- No specific land use response is identified. However there may be implications for the growth potential of areas utilising town water supplies (e.g. limited availability), and climate change may exacerbate some natural hazards with potential to require higher building construction standards. Flooding and bush fires may also become more intense, suggesting a conservative approach in critical areas.
- Promote energy efficient settlement through appropriate urban structure, transport systems and design.
- Periodic review through State of the Environment reporting.
- Rural water quality and availability and protection of catchments and resources

8.6 Rural water quality, availability and protection of catchments and resources

Many land uses are affected by the availability of adequate water of suitable quality. Water entitlements for rural subdivisions have the potential to reduce general water availability and security, although access to water is primarily the responsibility of the NSW Department of Environment and Climate Change under the provisions of the Water Management Act 2000.

In some instances, particular land uses or activities may have the potential to impact on water availability, and consideration should be given to whether these may require consent (e.g. rural industries, farm dams, plantation forests, and aquaculture) or whether special requirements may be desirable.

Protection of urban water supply catchments is a priority. Measures to identify and protect Singleton's urban water supply catchment may be implemented through the LEP and should take into account the recommendations of the Glennies Creek Total Catchment Management Study.

Objectives – Rural water quality, availability and protection of catchments and resources

- Maintain adequate water quality and availability to enable sustainable rural land use within the area.
- Ensure water availability, quality and protection of catchments and water resources is recognised in land use decision-making.

Policies – Rural water quality, availability and protection of catchments and resources

- Recognise Department of Natural Resources water sharing plan provisions for sub-catchments in land use decision-making.
- Rural rezoning or subdivision proposals shall be required to provide details of existing and proposed provision for water entitlements. Subdivisions which create additional basic water right entitlements on rivers or streams, or within catchments subject to high stress will not be supported.

Strategic Actions – Rural water quality, availability and protection of catchments and resources

- Include consideration of water implications of development as a general LEP objective.
- Include specific water quality and use objectives for rural zones (e.g. reference to Catchment Action Plan provisions and Hunter Water Sharing Plan).
- Consider including an LEP overlay identifying sub catchments and stressed streams.
- Include LEP provisions which require consideration of water entitlements and access in the determination of development applications for subdivision (except consolidation of lots).
- Prepare DCP provisions to provide guidelines on water availability and utilisation for development proposals.

8.7 Rural servicing costs and requirements

Important rural servicing requirements include roads, electricity, telecommunications, garbage services, bush fire services, and mail delivery. While these are adequately provided in most areas at present, further upgrading and ongoing maintenance are generally expensive and may be uneconomic for service providers.

Service provision is primarily an issue for Singleton Council and other agencies who are service providers, and is an important consideration in rural subdivision proposals, and other development proposals. The land use planning system provides a means of ensuring that community costs are taken into account in new rezoning proposals and development projects.

Objectives – Rural servicing costs and requirements

- Maintain adequate services and infrastructure for rural land use within the area.
- Ensure rural servicing costs and requirements are taken into account in land use decision-making.

- Generally limit extensions to current rural service areas to minimise ongoing maintenance costs.

Policies – Rural servicing costs and requirements

- Prepare clear Council policy guidelines (or DCP provisions) relating to service standards and requirements.
- Development within rural areas should not adversely affect rural infrastructure or existing service levels such as roads or electricity.
- Developers to be responsible for paying the full costs of capital upgrading for necessary services required by Council policy.
- Develop contributions plans or planning agreements to provide for necessary upgrading to rural infrastructure and services.
- Prepare a policy and requirements regarding use of non Council maintained roads for access in subdivision and development proposals, including agreement with the Department of Lands in relation to use of Crown roads for access.

Strategic Actions – Rural servicing costs and requirements

- Prepare a DCP and updated Section 94 contributions plan relating to rural servicing provision and costs. This may identify current levels of service in rural areas and areas where services will not be provided.
- Develop a policy on use of planning agreements to provide for infrastructure and services.
- Finalise agreement between Singleton Council and the Hunter Water Corporation in relation to the proposed future area of operations of the Corporation within Singleton LGA as outlined in Map 4.3.
- Seek to enter into a joint Section 94 contributions plan with Cessnock City Council to provide for road upgrading for roads that cross the LGA boundary.

8.8 Branxton-Whittingham corridor development options

Singleton Council anticipates pressure for a range of commercial, industrial, rural residential and residential development in the area generally between Branxton and Whittingham. This affects approximately 15 km of New England Highway frontage, and is primarily related to the foreshadowed extension of the F3 Freeway to Branxton and the identification in the Lower Hunter Regional Strategy of significant areas of land for investigation for potential urban development near Branxton.

The Department of Planning has held several meetings with Cessnock and Singleton Councils during 2007. One issue addressed in these meetings concerned planning and development in the Branxton area. In this respect, the Department in July 2007 advised as follows:

- *Cessnock Council has stated that it has no intention of pursuing new residential development in the vicinity of Branxton other than those already identified in the Lower Hunter Regional Strategy: Huntlee New Town (7200 dwellings), Greta Migrant Camp (up to 2000 dwellings) and Greta Wydham Street Precinct (approx 300 dwellings).*
- *Following initial consideration, there does not seem to be a need for an additional cross-LGA boundary strategic planning project. Apart from Huntlee (which has been declared State Significant and will be assessed under Part 3A) planning in the vicinity of Branxton is essentially a local scale planning exercise to be undertaken by each Council.*
- *Given the land supply provided by the above developments, there is unlikely to be a need for additional residential sites around Branxton for a considerable number of years.*
- *Via its local strategy, Singleton Council should consider opportunities for intensifying (or making minor adjustments to) existing and proposed rural residential zones close to Branxton.*

There will be ongoing consultation with Singleton and Cessnock Councils in respect of the Huntlee site, including the need for provision of local infrastructure in the Branxton/Huntlee area (this is not seen as a matter to be resolved in the current local strategy projects).

Accordingly, no additional residential land in the vicinity of Branxton will be provided for in Singleton LGA, other than south of the railway line as provided under the Lower Hunter Regional Strategy.

The demand for highway frontage land development in this location is primarily related to its location and relative accessibility by road to Newcastle and the Lower Hunter region, the advantages of sites having highway exposure, and projected growth in the Lower Hunter.

While recognising the potential demand for this type of development within the corridor in the future, determination to proceed with encouraging or allowing more intensive development in this location is premature at this time and during the Strategy timeframe. There are significant development constraints which would preclude any change to existing land use in the short to medium term, including the uneconomic provision and unavailability of necessary services (especially water), presence of listed endangered ecological communities and threatened species in the vicinity, the presence of Belford National Park in the area, and the desirability of consolidating commercial and industrial development in centres such as Singleton or Mount Thorley. In addition, ribbon urbanisation along the highway would detract from the scenic eastern entry to Singleton and detract from the identity of the town.

The land use planning priorities for this corridor should be as follows:

1. Retain the existing land use and subdivision pattern along the New England Highway frontage and in the vicinity.
2. Limit further subdivision of land fronting the New England Highway, based on current planning controls.

3. Maintain safe traffic conditions and scenic amenity by preventing development other than existing permissible dwelling houses or agricultural activities.
4. Not provide water reticulation, or other services which will support development.
5. Support consolidation of urban land uses within or adjacent to existing towns.
6. Reduce car and road dependence of development by locating commercial and industrial areas in more central locations where alternative public transport is available.
7. Review of these planning priorities for the area following the completion of construction of the F3 Freeway extension, in the context of the implementation of the Lower Hunter Regional Strategy.

The objectives, policies and strategic actions identified in this section should be read in conjunction with the Strategy proposals identified in Part 6 – Urban Settlement (especially Sections 6.1, 6.2, 6.4, 6.6, 6.7, and 6.8).

Objectives – Branxton-Whittingham corridor development options

- Maintain safe traffic conditions and scenic amenity along the New England Highway by retaining existing rural zonings and planning provisions.
- Limit further subdivision of land fronting the New England Highway.

Policies – Branxton-Whittingham corridor development options

- Adopt the priorities identified above for land between Branxton and Whittingham.
- No additional urban land to be rezoned within Singleton LGA in the Branxton-Whittingham corridor, including Belford.

Strategic Actions – Branxton-Whittingham corridor development options

- Include provision in LEP for the F3 freeway extension by inclusion of an acquisition zone, with consideration being given to identification of a noise exclusion overlay.
- Reach agreement with Hunter Water Corporation in relation to future for land use zoning and service provision in the Branxton-Whittingham corridor, taking into account the objectives and provisions of the Strategy.

8.9 Central West Rural Lands Inquiry

In February 2007, the Minister for Planning appointed an Independent Panel to investigate, report and make recommendations on land use planning in the Central West region of the State, having particular regard to balancing the protection of agricultural lands with other competing interests including, but not limited to, subdivision and rural residential development. The Panel met with a stakeholder reference group established by the Minister and consulted with a broad range of stakeholders and received submissions from interested persons.

A key recommendation contained in the Independent Panel's report release in August 2007 is the introduction of a new SEPP for Rural Lands containing provisions to guide new planning controls. The new SEPP would:

- *Set out the Government's policy direction and principles for rural planning including social, environmental and economic principles;*
- *Provide separate controls, including zones and requirements for buffers where necessary for Rural Residential, Small Farms and General Rural Zones in accordance with land capability, demand for rural lifestyle lots, potential for land use conflicts etc.*
- *Identify a comprehensive range of permissible uses in rural zones that would reflect recent trends in rural industry related tourism, restaurants, bed and breakfasts etc.*
- *Allow intensive agriculture on land zoned specifically for this purpose or in General Rural zones on merit where appropriate buffers are provided within the allotment to be developed for the intensive agricultural purposes;*
- *Remove provisions for Concessional Allotments;*
- *Rename 'minimum allotment sizes' as 'Lot Size for a Dwelling Entitlement' to make the intent of the development standard clearer;*
- *Maintain the existing 'Lot Size for a Dwelling Entitlement' development standard in General Rural zones in the LGAs unless good cause can be shown why the allotment size should be varied.*
- *Require that where a Council seeks to vary the 'Lot Size for a Dwelling Entitlement' development control in the General Rural zone, the proposed new allotment size shall be determined based on local circumstances and actual trends including the existing pattern of farming, existing pattern of holdings, current pressure for subdivision/dwellings, current pressure for change, reasons for change etc. and in consultation with the Department of Planning as the lead government agency with other government agencies inputting in an advisory capacity;*
- *Include SEPP 1 like clause that allows variation of the 'Lot Size for a Dwelling Entitlement' development control in exceptional circumstances where recommended by the Regional IHAP (refer below);*

- *Allow farm adjustment by boundary adjustment/land amalgamation etc (but with no additional dwelling entitlements);*
- *Preserve dwelling entitlements on existing allotments with separate title; and*
- *Require that new LEPs contain provisions that recognise the changing face of agriculture e.g. smaller farms, share farming, leasing, farms that are not necessarily contiguous and may be made up of a number of holdings many kilometres apart etc.*

(pp 18-19 *Review of Land Use Planning in the Central West*, Central West Rural Lands Inquiry, August 2007.)

Advice from the Department of Planning indicates that release of the Draft SEPP is imminent. At such time as details become available it will be necessary for the Draft Strategy's directions in respect of rural areas in Singleton to be reviewed.

9 ENVIRONMENTAL VALUES AND CONSTRAINTS

Many areas within Singleton have important environmental values and/or are subject to constraints which may limit development opportunities and need to be taken into account in planning. These areas should be identified in LEP provisions, and may require specific development control guidelines.

Key land use planning issues for Singleton relating to environmental values and constraints were identified in the Situation Analysis as follows:

- Natural hazards
- Land capability
- Catchment health
- Biodiversity and natural ecosystems
- Maintaining rural character and scale

These issues are presented below.

9.1 Natural hazards

Natural hazards are accepted as constraints to land use in order to limit damage to life and property. Within the rural areas of Singleton, these are primarily flooding and bushfires. Policy for natural hazards is primarily determined by NSW Government guidelines. A summary of available information and references is included in the Situation Analysis.

Various parts of Singleton are subject to flooding, but little information exists for areas other than for urban areas of Singleton, or the villages of Broke and Jerrys Plains.

Existing residential areas are relatively isolated from bushfire prone land, although significant areas of bushfire prone land in the LGA will impact upon the location of rural residential areas and other rural development.

Objectives – Natural hazards

- Ensure that natural hazards are considered when making development decisions, and that hazards are minimised wherever possible.
- Maintain current and accurate flooding and development data that guides land use planning decisions to limit damage to life and property.
- Identify land with potential for bush fire hazard and implement systems to minimise danger to life and property.

Policies – Natural hazards

- Adopt a consistent flood standard for Singleton, in accordance with floodplain management studies. Refer to Section 6.9.
- Recognise the need to appropriately consider bushfire, flooding and salinity as natural hazards in LEP provisions.

Strategic Actions – Natural hazards

Upgrade and maintain spatial information systems on natural hazards for planning overlay maps to be included in proposed LEP provisions:

- Include current bushfire mapping as an overlay.
- Include land with flooding limitations or requiring further investigation as an overlay.

9.2 Land capability

Regional scale rural land capability mapping exists for the whole LGA and provides information on limits to land use potential and management issues. This primarily focuses on soil erosion and slope stability.

Objectives – Land capability

- Ensure that future subdivision of land has regard to the capability of the land for future use, and that boundaries are located appropriately having regard to water catchments and capability considerations

Policies – Land capability

- Take into account land capability limitations in planning controls and development proposals (e.g. construction of roads and subdivision).

Strategic Actions – Land capability

- Upgrade and maintain spatial information systems on land capability for planning overlay maps to be included in proposed LEP provisions:
  - Identify rural land capability as an overlay.
  - Identify areas of environmental sensitivity through overlays, including attributes such as slope, vegetation, fauna, and identified 'at risk' communities and species habitat.
  - Map areas with identified salinity problems through an overlay.

9.3 Catchment health

Water supply catchments in rural areas provide essential urban water supplies and the maintaining of important agricultural activities.

Objectives – Catchment health

- To protect the quality and security of urban water supplies, by preventing incompatible land uses within water catchment areas.

Policies – Catchment health

- Development within urban water supply catchments is to maintain or improve water flow and quality.
- The priorities and provisions of the Hunter-Central Rivers Catchment Action Plan are to be taken into account in making decisions relating to future land use.

Strategic Actions – Catchment health

- Consider LEP provisions to restrict incompatible land uses, limit subdivision or impose development criteria to protect water supply.
- Map catchment boundaries in LEP and establish development criteria within catchments through LEP/DCP.
- Implement performance-based controls on environmental evaluation of all development within water supply catchments.
- Discourage further residential, industrial and/or rural residential development within water catchments.
- Ensure rural dwellings have a high standard of waste disposal.
- Link subdivision potential in rural areas to water availability and licensing under the Water Management Act 2000.

9.4 Biodiversity

Important areas for biodiversity which potentially may be impacted upon by further development and land use change are around Jerrys Plains and Branxton. Areas subject to coal mining and potentially suitable for residential expansion and rural residential development are likely to have biodiversity values which would be impacted upon by development. The strategy needs to take biodiversity values and the potential land use constraints into account.

Objectives – Biodiversity and natural ecosystems

- Maintain the ecological values of conservation reserves, and recognise their other economic benefits, including their role in supporting tourism.

- Zone conservation reserves appropriately in LEP.
- Minimise adverse impacts of development on land adjoining or affecting existing conservation reserves by establishing buffer areas and appropriate LEP provisions and development guidelines.
- Maintain or improve biodiversity values in Singleton. This includes protection and recovery of threatened species, communities and populations and their habitat, and endangered ecological communities.
- No net loss of native vegetation within the LGA.
- Consider opportunities to reverse the effect of Key Threatening Processes for threatened species, as identified under the *Threatened Species Conservation Act 1995* and the *Fisheries Management Act 1994*, when determining planning provisions and development proposals.

Policies – Biodiversity and natural ecosystems

- The value of biodiversity in Singleton will be recognised where decisions are made about land use.
- Areas of high biodiversity value will be protected in a network of reserves with buffers between them and incompatible land uses or activities.

Strategic Actions – Biodiversity and natural ecosystems

Proposed LEP provisions:

- Appropriate zoning of existing conservation reserves (E1 National Parks and Nature Reserves using Standard LEP provisions).
- Matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* are to be recognised in LEP provisions, including Ramsar wetlands, world heritage areas, migratory species, and Commonwealth-listed threatened species and threatened ecological communities. These matters should be identified on an LEP overlay map and be considered when determining zoning, permissible land uses in environmental protection zones, and buffer zone provisions.
- Consult with DECC as to whether any land should be reserved in the LEP for acquisition to be incorporated within existing reserves.
- Consult further with DECC in relation to suggested E2 and E3 zones. Investigate issues and management implications associated with recent mapping work and identified remnant areas of native vegetation.

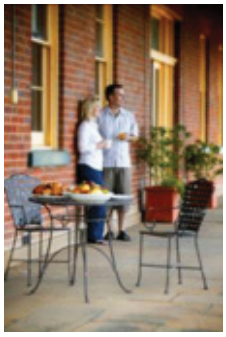
- Include appropriate zoning for proposed conservation reserve at Branxton South, as provided for in the Lower Hunter Regional Strategy.

Additional actions:

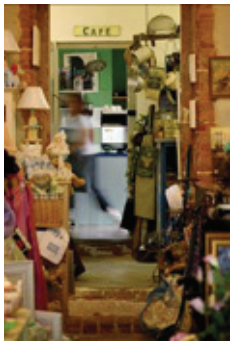
- Seek updating of the *Synoptic Plan - Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley* prepared by Department of Primary Industries (Minerals) to take into account biodiversity values.
- Consider introducing or encouraging use of financial incentives to support appropriate management of areas buffering conservation reserves.
- Consider identifying important regional, sub-regional and local wildlife and habitat corridors and incorporating these within an LEP overlay map, with appropriate provisions and/or environment zonings with suitable permissible and prohibited uses.
- Where significant natural values exist on private land, the Council will encourage the voluntary adoption of conservation agreements, the establishment of Private Protected Areas under the Natural Heritage Trust National Reserve System, Nature Conservation Trust Agreements and/or management plans. Consideration may be given to zoning land E2 Environmental Conservation.
- Request Department of Planning, Department of Environment and Climate Change and the Department of Environment and Water Resources to undertake or fund regional scale surveying and mapping of high quality native vegetation areas and the distribution of endangered ecological communities, for the purpose of including this information as an overlay map forming part of the LEP.
- Ensure consideration and implementation of appropriate threatened species legislation during determination of development applications (*Threatened Species Conservation Act 1995*, *Fisheries Management Act 1994* and the *Environment Protection and Biodiversity Conservation Act 1999*). Guidelines for the application of these provisions could be included in DCP provisions.
- Consider the incorporation of provisions within Development Control Plans to address and consider impacts upon threatened species, environmental conservation zone areas, wildlife corridors and areas of high quality native vegetation when applying for development consent. DCP provisions could include provisions for minimum ecological survey standards, and define local biodiversity values and policy to determine local interpretation of *maintaining or improving* biodiversity values.

- Prepare a policy or DCP provisions to identify mechanisms to be used to protect lands of conservation value (e.g. planning agreements or land dedication).
- Prepare and implement a policy framework for council acquisition of land requiring management for conservation purposes.

9.5 Maintaining heritage, rural character and scale



The Singleton rural area contains many sites of heritage significance. There are also landscapes with scenic and cultural values, which provide important social and economic benefits. Part of the protection of rural character relates to environmental amenity, including maintaining air quality and a quiet acoustic environment. Some scenic conservation areas have been identified by the National Trust of Australia, and planning measures could be considered for protecting these.



The need to conserve Singleton rural area's built heritage is important for tourism and maintaining identity and cultural history. There is a significant number of heritage items identified in the area and these are currently identified in the local environmental plan.

Singleton Council's Heritage Advisory Committee has reviewed and updated the schedule of heritage items and heritage conservation areas listed in the existing local environmental plan.

The Aboriginal Heritage Management System is maintained by the NSW Department of Environment and Climate Change, and is subject to confidentiality policies to protect sites. It identifies 2,654 sites of Aboriginal significance in Singleton LGA, most of which are in rural areas. There is also potential for many more to be identified.

Objectives – Maintaining heritage, rural character and scale

- Singleton will be a place where the rural landscape is valued as an important vista to the open, treed character of its urban neighbourhoods.
- European heritage is identified, protected and valued.
- Agencies will be encouraged to identify and protect Aboriginal heritage.

Policies – Maintaining heritage, rural character and scale

- Heritage and landscape will be taken into account by implementing standard LEP provisions and DCP guidelines.
- Where there is lack of information on these issues, further investigation will be required prior to zoning amendments or development consent.

Strategic Actions – Maintaining heritage, rural character and scale

- Implement Standard LEP clauses.
- Identify conservation areas and heritage items with overlays. Overlay maps will provide a trigger for further investigations.
- Separately distinguish built heritage from sensitive environmental areas through overlays.
- Consider using Standard Instrument rural landscapes zone, and/or include a map of scenic areas as an LEP map overlay.

10 PLANNING ADMINISTRATION AND STRATEGY IMPLEMENTATION

10.1 Implementation

The Strategy will be implemented by the Council through its normal administrative and planning processes. The following strategic actions relate to planning administration and implementation:

- It is desirable to prepare an LEP with common provisions to implement the Land Use Strategy in a consistent and uniform manner across Singleton.
- Ensure future service demands are integrated with Council financial and infrastructure planning.
- A combined land monitor for Singleton to be developed by the Council, particularly for residential, rural residential and industrial land.
- Clarify CMA role in determination of development proposals (especially in relation to native vegetation clearing and water entitlements), consistent with Standard LEP provisions.

The Land Use Strategy provides a land use structure and policy framework for Singleton. It closely relates to a range of other formal and informal plans and documents, such as council management plans, LEPs in adjoining LGAs, catchment action plans, road and utility infrastructure planning, tourism development, state of the environment reporting programs, etc. Key plans and documents are shown in table 15.

Table 15: Strategy relationship with other plans and programs

Plan or program	Relationship to strategy	Comment
Council management plan	Identifies council visions and priorities, and administrative framework	Council management plan must complement the Land Use Strategy
Council 2030 Strategy	Sets long term administrative and social objectives for LGA	Complements the Singleton Land Use Strategy.
Local environmental plans	Key instrument for regulating land use and implementing Strategy	Development control plans may be made by the council to identify land use guidelines for matters not included in LEP provisions
Catchment action plans	CAPs identify investment priorities for catchment management authority funding, but	Relationship with LEP is not clear

Plan or program	Relationship to strategy	Comment
State of the environment report (SoE)	Enables monitoring of achievement of strategy objectives and environmental indicators	Information from the Situation Analysis may be included and updated in SoE

Implementing the Strategy requires the preparation of draft LEP provisions under the *Environmental Planning and Assessment Act 1979*. This provides the regulatory framework for land use, and where possible should not duplicate other approval processes (e.g. native vegetation clearing, water use, etc).

Strategy implementation also requires further strategic land use analysis of some issues and the preparation of land use guidelines through the preparation of development control plans (DCPs). DCPs are considered in the assessment of development proposals for which consent is required by a LEP. Table 16 shows the scope of future strategic work program priorities. It is anticipated that the program can be built upon with subsequent studies and information.

Table 16: Future strategic work program priorities

Issue	Proposed action
Preparation of development control plans	DCP provisions should be prepared for the following where required: • Infill residential subdivision, development and urban sustainability guidelines • Industrial development guidelines • Rural residential subdivision and development guidelines
Strategic biodiversity review of proposed development areas	Undertake further review of biodiversity information for the Sub-region and detailed assessment of issues relating to proposed development areas. Investigate opportunities for biodiversity certification of LEP and flora and development fauna survey requirements
Contributions plans	Update contributions plans based on the strategy and LEP provisions, and prepare guidelines for use of planning agreements within Singleton

10.2 Monitoring and Review

The Singleton Land Use Strategy outlines the key land use policies and directions for the LGA. It provides the planning context for the preparation of a Shire wide local environmental plan. The Strategy has a time frame of 25 years, to 2032, but also provides a broad planning framework for the long term future of the LGA to 50 years plus.

Singleton Council will monitor the implementation of the Strategy in its annual State of the Environment Report, prepared under the Local Government Act 1993. This monitoring and review of the Strategy will be closely undertaken with the Department of Planning and other relevant agencies. Importantly, also, the assumptions on housing demand, population growth, industrial land demand, and economic development affecting the LGA, generally, will be the subject of a major review undertaken jointly every 3 years by the Council and the Department of Planning. The major reviews will also be undertaken to update as necessary the Strategy's Objectives, Policies and Strategic Actions. The LEP and other documents, such as the DCP and Section 94 Plans, will then be appropriately amended. In this way, the Singleton Land Use Strategy will become a dynamic document, able to be refined and updated over time, but able to always maintain its fundamental strategic planning direction in guiding the future growth and change of the LGA.

Appendix 2 – Ecological Constraints Study

ECOLOGICAL CONSTRAINTS REPORT

for a proposed

rezoning

at

Lot 404 DP 866648 & Lot 1 DP 1060691

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Job No. 11925 ***March 2009***

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1.0 INTRODUCTION

This Ecological Constraints Report has been produced to provide an informed preliminary assessment and comment on any potential site-specific ecological constraints that may effect the rezoning of Lot 404 DP 866648 & Lot 1 DP 1060691 Rusty Lane, Branxton, NSW (Figure 1). All native flora and fauna have been taken into consideration with a particular focus on threatened species and communities that have been reported or have potential habitat in the locality. This report will also incorporate a previous Statement of Effect on Threatened Flora and Fauna carried out within the site (Wildthing Environmental Consultants, 1997).

1.1 GENERAL DESCRIPTION OF THE SITE

The site comprising Lot DP 866648 and Lot 1 DP 1060691 is located either side of Rusty Lane approximately 3km to the north-west of the settlement of Branxton (Figure 2). The majority of the 43 hectare site was located to the south of Rusty Lane with a smaller triangular segment of land approximately 0.7ha in size present on the northern side. The site consisted of undulating ground and has been used primarily for grazing purposes. A small number of ephemeral drainage lines were present with the larger drainage line in the east containing a constructed dam. Another smaller dam was also present in the south of the site. According to the Soil Landscapes of the Singleton 1:250000 map sheet (Kovac & Lawrie, 1991) the site occurs on the Rothbury Soil Landscape and consists of Red Podzolic Soils on the upper slopes with Yellow Podzolic Soils on the mid slopes. Yellow Solodic Soils and Brown Soloths occur on the lower slopes. Prairie Soils occur in the drainage lines. A small amount of parent conglomerate rock was exposed on the surface over the site.

The vegetation was generally composed of cleared pasture with scattered and clumped remnant trees particularly within the drainage lines. Despite the majority of the original vegetation being removed approximately 2 hectares of remnant native vegetation in the form of woodland was found to be present in the south-western corner of the site.

Similar agricultural land to that occurring on site was present to the north over Rusty Lane and to the east of the site with a relatively recent rural residential subdivision occurring to the south. An area of native woodland bordered the site to the west.

1.2 DESCRIPTION OF PROPOSAL

It is proposed that land composed of Lot 404 DP 866648 and Lot 1 DP 1060691 which are currently zoned 1(a) Rural Zone in accordance with the Singleton Local Environmental Plan, (1996) be rezoned to R5 - Large Lot Residential Land. The land will ultimately be proposed to be developed as a rural residential subdivision consisting of lots approximately 4000m2 in size.

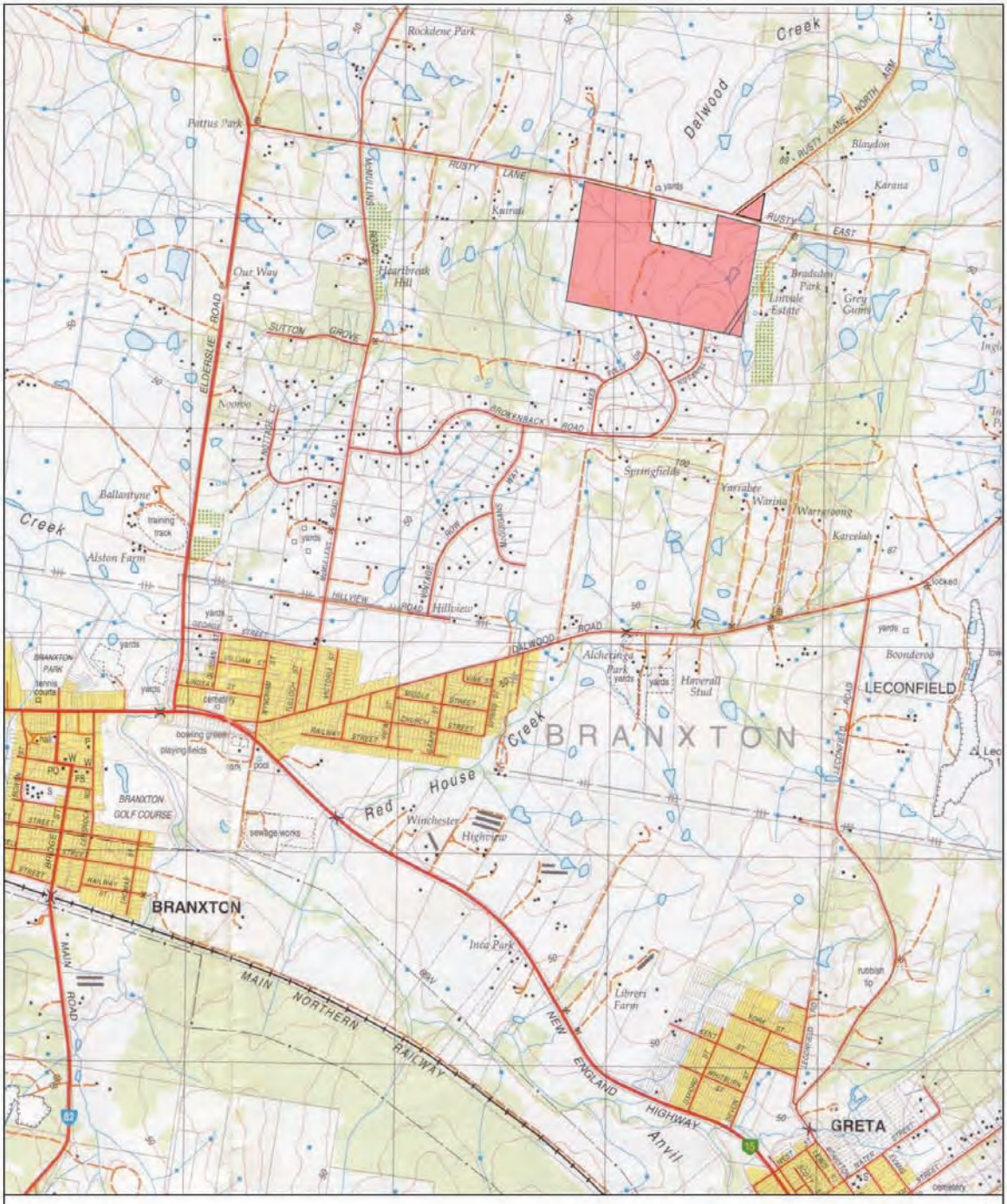

Figure 1: Location of Site Lot 404 DP 866648 & Lot 1 DP 1060691

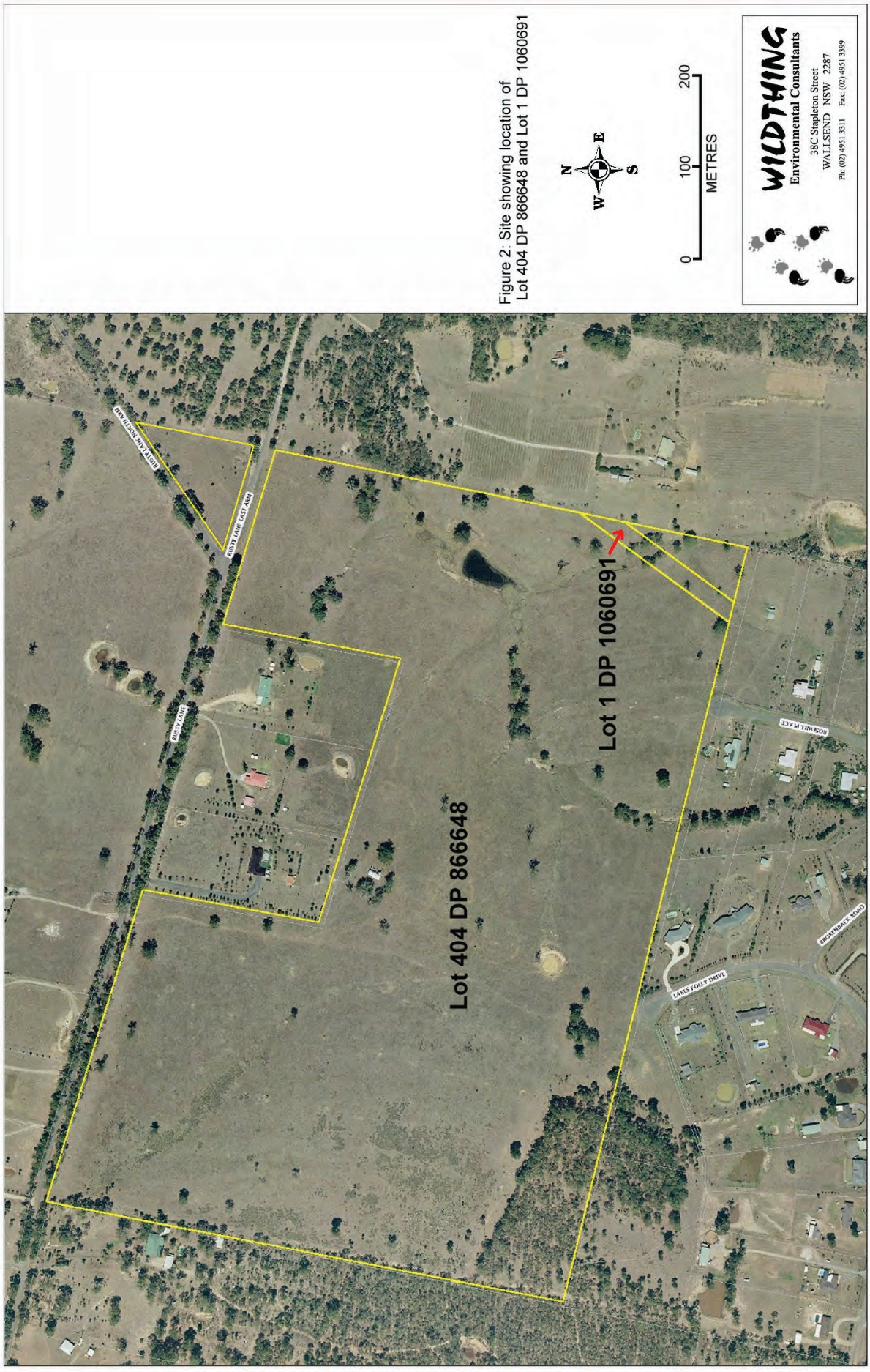
Figure 2: Site showing location of
Lot 404 DP 866648 and Lot 1 DP 1060691
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Ph: (02) 4951 3311 Fax: (02) 4951 3399
Lot 404 DP 866648
Lot 1 DP 1060691
RUSTY LANE
RUSTY LANE EAST ARM
RUSTY LANE NORTH ARM
ROSEHILL PLACE
LAKES FOLLY DRIVE
BROKENBACK ROAD

2.0 SCOPE OF THE STUDY

This report was designed to assess the site and identify any apparent developmental constraints in ecological terms that may affect its future development potential. The assessment includes mapping the plant communities and habitats, and a survey of the fauna utilising the site. Survey methods have been confined to the site, although surrounding areas have been considered in the habitat assessment.

2.1 LEGISLATIVE REQUIREMENTS

As an ecological constraints study, this report comprises surveys undertaken to determine the presence or absence of 'endangered' or 'vulnerable' (collectively referred to as 'threatened') species and their habitats. This study is a preliminary assessment within the overall planning phase, and is aimed at providing informed comment on the likely implications of future development of the site. Legislation which has been considered in the production of this report includes the Environmental Planning and Assessment (EPA) Act (1979) and the Threatened Species Conservation (TSC) Act (1995), which requires consideration of the impact of proposed developments upon protected fauna and flora, particularly threatened species. Also considered in this report was the applicability of State Environmental Planning Policy 44 – 'Koala Habitat Protection' and the Commonwealth Environment Protection and Biodiversity Conservation Act (1999).

Fieldwork undertaken by Wildthing Environmental Consultants was carried out under the following NPWS Scientific Investigation Licence S10475 and under Animal Care and Ethics Approval: Animal Research Authority Issue by the Director General of NSW Agriculture (File No. 08 – 361) for the Fauna Survey for Biodiversity and Impact Assessment.

3.0 METHODOLOGY

3.1 VEGETATION SURVEY METHODOLOGY

The initial determination of the basic vegetation community boundaries was undertaken through the review of an orthophoto covering the site. Following this, a detailed ground survey was conducted. The vegetation survey was undertaken in accordance with the Flora and Fauna Survey Guidelines: Lower Hunter and Central Coast Region (Murray. et. al, 2002). Due to the disturbed and cleared nature of the majority of the site most of the vegetation was appraised in a manner described by Cropper (1993) as the 'Random Meander Technique'. This involved walking in a random manner throughout the entire study area, visiting the full range of potential habitats and checking every plant species seen. Searches for threatened plants as listed in the various schedules of the Threatened Species Conservation Act (1995) was undertaken during this survey.

A vegetation transect and plot survey was also undertaken within the area of better quality remnant vegetation in the south-west of the site. This involved one 100m vegetation transect and two plots 20x20m in area. During the transect-based surveys all species observed within 2m either side of the centre line were recorded as well as the physical attributes of the surrounding area. Within the survey plots, the height of each primary structural layer and relative cover abundance of the species within was recorded, along with location, elevation, slope, aspect and general soil type. A summary of the vegetation found over the study area can be seen in Section 4.2 of this report. A list of all flora species identified over the study area has been provided in Appendix B.

3.2 HABITAT SURVEY METHODOLOGY

Habitat may be defined as the physical and biological environment required for the survival of a specific population of a species. In modern usage, habitat has also come to be regarded as an association of landform and plant life, which provides sustenance and shelter for a particular fauna assemblage. While the former definition is often that invoked by legislation requiring the consideration of the impact of a development on a threatened species, the latter probably has equal validity from an ecological point of view.

The methodology employed by this habitat survey used the vegetation community data combined, where relevant, with geomorphological features to provide a basis for a subjective habitat assessment aimed at placing the ecological status of this site within a local perspective.

3.3 HOLLOW-BEARING TREE SURVEY

Hollow-bearing trees are a habitat resource type, which is utilised by a variety of native avifaunal and mammalian species. This resource is usually a limiting factor in the occurrence of hollow-dependent species on a site, due to the time taken for hollows to form in trees. During the fieldwork a survey

was undertaken to identify the number of hollow-bearing trees within the study area and to classify the size of the hollow openings.

3.3.1 GENERAL HABITAT FOR NATIVE SPECIES

From the vegetation assessment and general description of the site and surrounding areas, a subjective assessment of the general habitat value of the site was made. Considered in this assessment were:

- occurrence of that habitat type in the general vicinity;
- degree of disturbance and degradation;
- area occupied by that habitat on site;
- continuity with similar habitat adjacent to the site, or connection with similar habitat off site, by way of corridors; and
- structural and floral diversity.

3.3.2 HABITAT FOR SIGNIFICANT SPECIES

This site was evaluated as potential habitat for each of the threatened species reported on the Department of Environment and Climate Change (DECC) Database and the Department of Environment, Water, Heritage and the Arts (DEWHA) on-line database from within 10km of the site. This evaluation was based on home-range, feeding, roosting, breeding, movement patterns and corridor requirements for fauna and hydrology, soil types, aspect and structural formation for flora species.

3.4 FAUNA SURVEY METHODOLOGY

The fauna survey undertaken consisted of the production of an Expected Fauna Species List, an assessment of the potential use of the site by any threatened species identified in the DECC Database and the confirmation and supplementation of the Expected Fauna Species List by observation and recording on the site as described below.

3.4.1 DIURNAL SURVEYS

The diurnal surveys undertaken on the site involved:

- avifauna surveys;
- reptile and amphibian searches; and
- searches for secondary indications of fauna presence.

The surveys for diurnal avifauna species were conducted at peak activity periods (i.e. dusk) and involved identifying the birds seen and heard at various points in the study area during a 30-minute period. Incidental observations of avifauna during other surveys were also noted.

Diurnal searches for reptiles involved searching in likely habitat such as leaf litter and fallen timber during peak activity times i.e. early afternoon. The locations of the avifauna and reptile surveys are shown in Figure 3.

Secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted and included searches for scratch marks on tree trunks, scats, whitewash and regurgitation pellets from Owls, chewed (Allo)Casuarina cones from Black-Cockatoos and other obvious features such as raptor nests.

3.4.2 NOCTURNAL SURVEYS

The nocturnal surveys undertaken included:
searches for frog species;
recording of microchiropteran bat calls;
an owl call playback census; and
spotlighting.

Searches for frogs involved spotlighting and recording any calls heard on site or immediately adjacent to the site. Recorded calls were identified by auditory comparison with commercially available frog call recordings. The surveys were undertaken in suitable habitat and in optimal weather conditions and involved listening for the characteristic call of male frogs, playback of pre-recorded calls of locally threatened species particularly *Litoria aurea* (Green and Golden Bell Frog) and active searches using a spotlight. The location of the amphibian surveys are shown in Figure 3.

Microchiropteran bat calls were detected using an Anabat detector in a mobile survey. The survey was conducted for 80 continuous minutes over one night. The mobile detection route is shown in Figure 3. The transformed calls were analysed using computer and identified by comparison with sample bat calls.

The nocturnal owl call playback census involved the broadcasting of pre-recorded calls of *Tyto novaehollandiae* (Masked Owl), *Ninox strenua* (Powerful Owl) and *Ninox connivens* (Barking Owl) through an amplification system designed to project sound for at least 1km under still night conditions. The calls were repeated several times in four different directions and replies were listened for after each call. The position of the nocturnal call playback census is shown in Figure 3.

The nocturnal surveys described above were supplemented by spotlighting using 55-Watt hand-held spotlights. This was undertaken for approximately four person hours over one night (Figure 3).


KEY
Spotlighting/Anabat Route
Owl Call Playback
Amphibian Survey
Avifauna Survey
Reptile Survey
Figure 3: Location of targeted fauna surveys
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3.5 SURVEY DATES, TIMES & WEATHER CONDITIONS

A summary of the time spent on site and the prevailing weather conditions is contained below in Table 1.

Table 1: Survey dates, times and weather conditions

DATE	TIME	WORK COMPLETED	WEATHER
19/02/09	1400 – 1930	Site Inspection Vegetation Survey Search for Reptiles Avifauna Survey Searches for Secondary Indications of Fauna	2/8 cloud, Calm, 27ºC.
	2000 - 2130	Microchiropteran Bat Call Survey Frog Survey Spotlighting Owl Call Playback	2/8 cloud, Calm, 24ºC. No moon present

3.6 SIGNIFICANT SPECIES

The following threatened species and endangered populations have been recorded on the DECC Database within 10km of the site. Species marked with an asterisk (*) are considered to have potential habitat available within 10km according to the according to the DEWHA on-line database (Table 2).

Table 2: Threatened Species Considered.

Scientific Name	Common Name	TSC Act 1995	EPBC Act 1999
**Cryptostylis hunteriana*	Leafless Tongue-orchid	V	V
Eucalyptus glaucina	Slaty Red Gum	V	V
**Eucalyptus parramattensis* ssp. *decadens*	Drooping Red Gum	V	V
**Grevillea parviflora* ssp. *parviflora*	Small-flowered Grevillea	V	V
Acacia bynoeana	Bynoe's Wattle	E	V
Rutidosis heterogama	Wrinklewort	V	V
**Persoonia pauciflora*	North Rothbury Persoonia	Crit E	E
Litoria aurea	Green and Golden Bell Frog	E	V
**Mixophyes balbus*	Stuttering Frog	V	V
**Mixophyes iteratus*	Giant Barred Frog	E	E
Ephippiorhynchus asiaticus	Black-necked Stork	E	
**Rostratula benghalensis* ssp. *australis*	Australian Painted Snipe	E	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	
Lathamus discolor	Swift Parrot	E	E
Neophema pulchella	Turquoise Parrot	V	
Pyrrholaemus sagittatus	Speckled Warbler	V	
Xanthomyza phrygia	Regent Honeyeater	E	E
Grantiella picta	Painted Honeyeater	V	
Climacteris picumnus victoriae	Brown Tree-creeper	V	
Melithreptus gularis gularis	Black-chinned Honeyeater	V	
Pomatostomus temporalis ssp. *temporalis*	Grey-crowned Babbler	V	
Lophoictinia isura	Square-tailed Kite	V	

Scientific Name	Common Name	TSC Act 1995	EPBC Act 1999
Ninox connivens	Barking Owl	V	
Ninox strenua	Powerful Owl	V	
Tyto novaehollandiae	Masked Owl	V	
**Petrogale penicillata*	Brush-tailed Rock-Wallaby	E	V
Phascogale tapoatafa	Brush-tailed Phascogale	V	
**Dasyurus maculatus* ssp. *maculatus*	Tiger Quoll	V	V
Phascolarctos cinereus	Koala	V	
Petaurus norfolcensis	Squirrel Glider	V	
**Pseudomys oralis*	Hasting River Mouse	E	E
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
**Chalinolobus dwyeri*	Large Pied Bat	V	V
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	
Miniopterus australis	Little Bentwing-bat	V	
Miniopterus schreibersii ssp. *oceanensis*	Large Bentwing-bat	V	
Mormopterus norfolkensis	Eastern Freetail-bat	V	
Myotis adversus	Large-footed Myotis	V	
Scoteanax rueppellii	Greater Broad-nosed Bat	V	
Vespadelus troughtoni	Eastern Cave Bat	V	

E=Endangered Species **V=Vulnerable Species**

Crit E=Critically Endangered Species

4.0 RESULTS

4.1 VEGETATION SURVEY RESULTS

The site has been used for as a grazing property (primarily cattle) over a long period of time and was found to be generally composed of four vegetation assemblages:

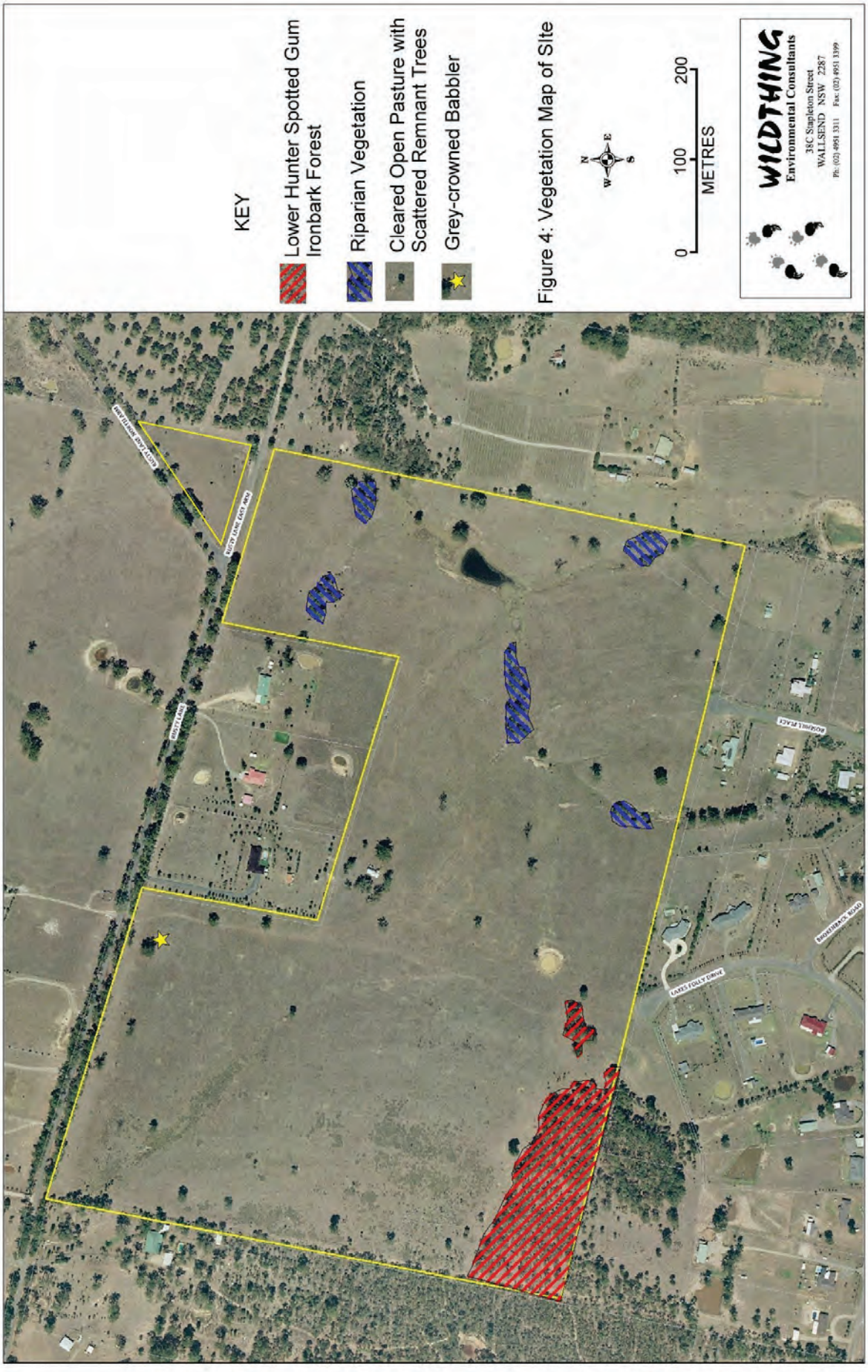
- Cleared Open Pasture with scattered remnant trees;
- Spotted Gum – Ironbark Woodland;
- Riparian Vegetation;
- Aquatic Vegetation.

A general description of the flora assemblages identified on site is given below and a map of the vegetation present on site is shown in Figure 4. The full flora list compiled for the site is contained in Appendix B.

*Note on Vegetation Community Distribution Map. A map of vegetation of any area seeks to describe the distribution of the plant species in that area by defining a number of vegetation units (assemblages or communities), which are relatively internally homogenous. Whilst such mapping is a convenient tool, it greatly oversimplifies the real situation. Plants rarely occur in defined communities with distinct boundaries. Accordingly vegetation units used for the accompanying map should be viewed as indicative of their extent rather than being precise edges of communities.

Cleared Open Pasture with scattered remnant trees

Cleared pasture constituted the majority of the vegetation within the site and included the triangular segment on the (Figures 5, 6, 7 & 8). This assemblage was primarily composed of grasses and low herbaceous species. Common grass species noted included introduced species such as *Axonopus affinis* (Narrow-leaved Carpet Grass) and native species such as *Themeda triandra* (Kangaroo Grass) and *Cynodon dactylon* (Common Couch). Herbaceous species noted included the introduced *Sida rhombifolia* (Paddy's Lucerne), *Centaurium erythraea* (Common Centuary) and *Gomphocarpus fruticosus* (Narrow-leaved Cotton Bush). *Pimelea linifolia* ssp. *linifolia* (Rice Flower) was a common native small shrub noted over a large area of the site. *Melaleuca thymifolia* (Thyme-leaved Paperbark) was also a common shrub species within the south-west portion of the site. *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Corymbia maculata* (Spotted Gum) were the most numerous scattered remnant trees within this assemblage.


KEY
Lower Hunter Spotted Gum Ironbark Forest
Riparian Vegetation
Cleared Open Pasture with Scattered Remnant Trees
Grey-crowned Babbler
Figure 4: Vegetation Map of Site
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38C Stapleton Street
WALLSEND NSW 2287
Ph: (02) 4951 3311 Fax: (02) 4951 3399
ROSEMULL PLACE
MOUNTHAWK ROAD
LAKES FOLLY DRIVE

Figure 5: Pasture within the southern portion of the site.

Figure 6: Pasture within the central portion of the site.

Figure 7: Pasture within south-west of site.

Figure 8: Pasture within triangular segment of land to the north of Rusty Lane.

Spotted Gum - Ironbark Woodland

Approximately 2 hectares of Spotted Gum – Ironbark Woodland was found to be present in the south-west corner of the site (Figures 9 & 10). A smaller isolated remnant approximately 0.1ha in area was also present nearby to the east. The larger remnant had been subject to a number of disturbances from past vegetation clearance and cattle grazing. This disturbance was evidenced by a number of cut stumps, regrowth of canopy species and the small number of shrub species present. The smaller remnant was found to be highly disturbed and composed of a small number of canopy species.

Canopy species noted within the larger remnant included *Corymbia maculata* (Spotted Gum), *Eucalyptus fibrosa* (Broad-leaved Ironbark) and *Eucalyptus crebra* (Narrow-leaved Ironbark). The mid storey was dominated by a regrowth of younger specimens of *E. crebra*. This mid-storey regrowth was more prominent in the western portion of the remnant. Another less common mid-storey species was *Melaleuca decora* (White Feather Honeymyrtle). Canopy species present within the small remnant were *C. maculata* and *E. fibrosa*.

Common shrub species observed within the larger remnant included *Daviesia ulicifolia* ssp. *ulicifolia*, *Ozothamnus diosmifolius* (Everlasting), *Acacia elongata* and *Melichrus urceolatus*. The ground layer was dominated by native grass species such as *Themeda triandra* (Kangaroo Grass), *Echinopogon caespitosus* var. *caepitosus* (Hedgehog Grass), *Entolasia stricta* (Hairy Panic Grass) and *Aristida vagans* (Three-awn Grass). Other ground covers recorded included *Lepidosperma laterale* (Swordgrass), *Pomax umbellata* (Pomax), *Lomandra multiflora* ssp. *multiflora* (Many-flowered Mat-rush) and *Laxmannia gracilis* (Slender Wire Lily). No native understorey vegetation was noted within the smaller remnant.

A larger adjoining area of Spotted Gum – Ironbark woodland was present to the west of the site with a smaller adjoining area to the south within the rural residential subdivision. According to The Vegetation of the Central Hunter Valley, New South Wales (Peake, 2006) this woodland remnant has been mapped as Lower Hunter Spotted Gum – Ironbark Forest. Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion (NPWS, 2005) is listed as an Endangered Ecological Community in Part 3 of Schedule 1 of the Threatened Species and Conservation Act (TSC Act, 1995). The occurrence of this community on site has been further addressed in Sections 4.1.2 and 5.0 of this report.

Figure 9: Spotted Gum – Ironbark Woodland contained within eastern portion of remnant.

Figure 10: Spotted Gum – Ironbark Woodland present within western portion of remnant.

Riparian Vegetation

Small clumped areas of remnant riparian vegetation were found to be present within the ephemeral drainage lines within the eastern portion of the site. These areas were found to be highly disturbed and of varying composition. Generally the riparian assemblages were lacking an understorey and were composed of a groundcover of native and introduced grass species.

The larger area of riparian vegetation located in the centre of the eastern portion of the site was composed of the canopy species, *Eucalyptus tereticornis* (Forest Red Gum) and an understorey of *Casuarina glauca* (Swamp Oak)(Figure 11). Other tree species present included *Eucalyptus crebra* and *Melaleuca decora* (White Feather Myrtle). *Angophora floribunda* (Rough-barked Apple) was the dominant remnant canopy species within the drainage line in the north-east of the site (Figure 12). Specimens of *Eucalyptus tereticornis* and *E. crebra* occupied the drainage line in the south-east corner of the site (Figure 13) and a pure stand of *M. decora* was present in the central far south (Figure 14). Common ground covers found within all of the riparian assemblages included *Microlaena stipoides* var. *stipoides* (Weeping Meadow Grass) and *Cynodon dactylon* (Common Couch).

Figure 11: Larger area of riparian vegetation within the centre of the eastern portion of the site.

Figure 12: Rough-barked Apple trees present in the drainage line in the north-west of the site.

Figure 13: Stand of *Melaleuca decora* within the drainage line in the far south of the site.

Figure 14: Riparian vegetation in the far south-east of the site.

The areas of riparian vegetation were found to contain similarities to two locally occurring vegetation communities, Hunter Lowlands Red Gum Forest (Peake, 2005 & NPWS, 2000) and Central Hunter Swamp Oak Forest (Peake, 2005).

Freshwater Wetland Vegetation

Vegetation adapted to wetter conditions was present in and around the two dams and parts of the ephemeral drainage lines (Figures 15, 16, 17 & 18). Common species observed around the edges of the waterbodies included *Juncus usitatus* (Common Rush) and *Paspalum distichum* (Water Couch). Aquatic flora observed within the large dam and parts of the drainage line included *Ottelia ovalifolia* (Swamp Lily), *Marsilea* sp. (Nardoo) and *Elaeocharis* sp.

Figure 15: Larger dam within the main drainage line in the east of the site.

Figure 16: Small farm dam in south of site.

Figure 17: Main drainage line within the centre of the site.

Figure 18: The drainage line in the far north-west of the site showing the weedy *Juncus acutus*.

4.1.2 ENDANGERED ECOLOCICAL COMMUNITIES

As previously stated the 2 hectare remnant of Spotted Gum – Ironbark Woodland present in the south-west corner of the site has been previously mapped as Lower Hunter Spotted Gum – Ironbark Forest (Peake, 2005). The vegetation survey largely agreed with the mapping although the assemblage also contained a number of species found in the closely related Central Hunter Spotted Gum – Ironbark – Grey Box Forest, which also occurs in the local area (Peake, 2005). Considering the species composition and previous mapping the remnant on site is most likely Lower Hunter Spotted Gum – Ironbark Forest. As a consequence it is recommended that this remnant on site be left in-situ as part of any future development.

Highly disturbed remnant riparian vegetation contained within the drainage lines in the eastern portion of the site was found to contain flora species common to two locally occurring Ecological Communities, Hunter Lowlands Red Gum Forest (Peake, 2005 & NPWS, 2000) and Central Hunter Swamp Oak Forest (Peake, 2005). Hunter Lowlands Red Gum Forest in the Sydney Basin Bioregion (NPWS, 2000) is listed as an Endangered Ecological Community. Although highly disturbed it is recommended that these remnants are also left in-situ within any development within the site. A buffer between any development and most of the ephemeral drainage lines would be expected to be set aside to meet the requirements of the DECC.

The dams and drainage lines on site contained a number of flora species found within the Endangered Ecological Community Freshwater Wetland Complex. However the vegetation contained within the dams and ephemeral drainage lines would be unlikely to be included within this Endangered Ecological Community.

4.1.3 THREATENED AND RARE FLORA SPECIES

Seven threatened flora species together with five rare species Briggs and Leigh (1996) have been previously recorded within 10km of the site on the DECC database (Table 3). Species marked with an asterisk (*) are considered to have potential habitat within 10km according to DEWHA on-line database.

Threatened Flora Species:

- *Eucalyptus glaucina* Slaty Red Gum
- *Eucalyptus parramattensis* ssp. *decadens* Drooping Red Gum
- *Persoonia pauciflora* North Rothbury Persoonia
- *Acacia bynoeana* Bynoe's Wattle
- *Grevillea parviflora* ssp. *parvifolia* Narrow-leaved Grevillea
- *Rutidosis heterogama* Wrinklewort
- **Cryptostylis hunteriana* Leafless Tongue-orchid

Rare Flora Species:

- *Grevillea montana*
- *Eucalyptus fergusonii* ssp. *fergusonii*
- *Macrozamia flexuosa*
- *Bothriochloa biloba*
- *Diuris* sp. Aff. *dendrobioides* (Hunter Valley)

During the flora survey no specimens of the abovementioned threatened species were found. Habitat was found to be available for the threatened species *Eucalyptus glaucina*, *Eucalyptus parramattensis* ssp. *decadens*, *Grevillea parvifolia* ssp. *parviflora*, *Rutidosis heterogama*, *Acacia bynoeana* and *Persoonia pauciflora*. With the exception of *Eucalyptus glaucina* the site is currently considered to be outside the known local range for the remaining threatened species.

A number of specimens of *Grevillea montana* listed as rare by Briggs and Leigh (1996) were found within the western portion of the Spotted Gum – Ironbark remnant in the south-west of the site. A small number of specimens were also located within the adjacent cleared pasture area within the site. In recent years, survey works within National Parks and other protected areas have revealed substantial populations of both these rare plant species (Bell, 2001).

Habitat was found to be present for the remaining rare species *Eucalyptus fergusonii* ssp. *fergusonii*, *Macrozamia flexuosa*, *Bothriochloa biloba* and *Diuris* sp. aff. *dendrobioides* (Hunter Valley). It must be noted that the fieldwork was carried out outside the flowering season for Diuris sp. aff. *dendrobioides* which is December to January.

It is considered unlikely that the proposed rezoning would lead to the local extinction of any of the addressed threatened or rare flora species, particularly given the recommendation to protect protection of the area of remnant woodland and vegetation contained within the drainage lines.

4.1.4 REGIONALLY SIGNIFICANT FLORA

A list of Regionally Significant Plant species, populations and vegetation communities for the Hunter Catchment has been established by the Hunter Rare Plants Committee of the Hunter Regional Botanic Gardens (Bell et. al., 2003). A small number of regionally significant flora species other than those listed as threatened or considered to be rare were recorded on site. These species include:

- *Acacia falcata* western limit of its distribution
- *Goodenia rotundifolia* southern limit of distribution
- *Imperata cylindrica* var. *major* western limit of its distribution

4.2 HABITAT SURVEY RESULTS

4.2.1 HABITAT DESCRIPTION & DISTRIBUTION IN THE VICINITY

The majority of native habitat had been largely removed from the site as a result of historical vegetation clearance and continued grazing. With the exception of the area of remnant woodland in the south-west corner of the site and the drainage lines the remainder of the site would only provide resources for those species adapted to disturbed open habitat.

The Open Pasture, although composed of largely introduced species and few trees, provided foraging habitat for granivorous species i.e. Rosellas, and grazing species particularly Kangaroos. The few remaining remnant tree species provided a variety of resources for native fauna including blossom for nectivorous species such as Flying-foxes and various foraging surface types for insectivorous avifauna species. A low number of mature hollow-bearing trees noted in the north of the site would provide nesting/roosting habitat for a range of hollow-dependent fauna i.e. Microchiropteran Bats and Parrots. Hunting habitat for microchiropteran bats was available over all of the site and adjacent areas.

The 2 hectare area of remnant woodland provided potential habitat for a number of fauna species. Foraging and nesting habitat was available for several guilds of avifauna. Nectivorous species would find seasonal foraging resources, in the form of flowering myrtaceous species. Birds of prey are accommodated by the availability of prey such as small birds, reptiles and small mammals. Hollows within trees, fallen branches and timber provide habitat opportunities for reptiles such as snakes and lizards, small mammals and frogs. Trees within the smaller nearby remnant to the east was found to contain several nestboxes.

The dams and ephemeral drainage lines provided habitat for a number of species such as frogs, turtles and fish. The dams also provide nesting habitat and foraging for waterbirds. These areas also provide a drinking resource for avifauna, reptiles and mammals.

Woodland habitat bordered the site to the west and south-west and a narrow band of remnant woodland was present within the road reserves along Rusty Lane to the north. Further north similar cleared pasture habitat to that occurring on site was present. Cleared grassy habitat was present to the east along with a small area of remnant woodland. Rural residential development composed of large areas of cleared grassy habitat was present to the south.

4.2.2 HOLLOW-BEARING TREES

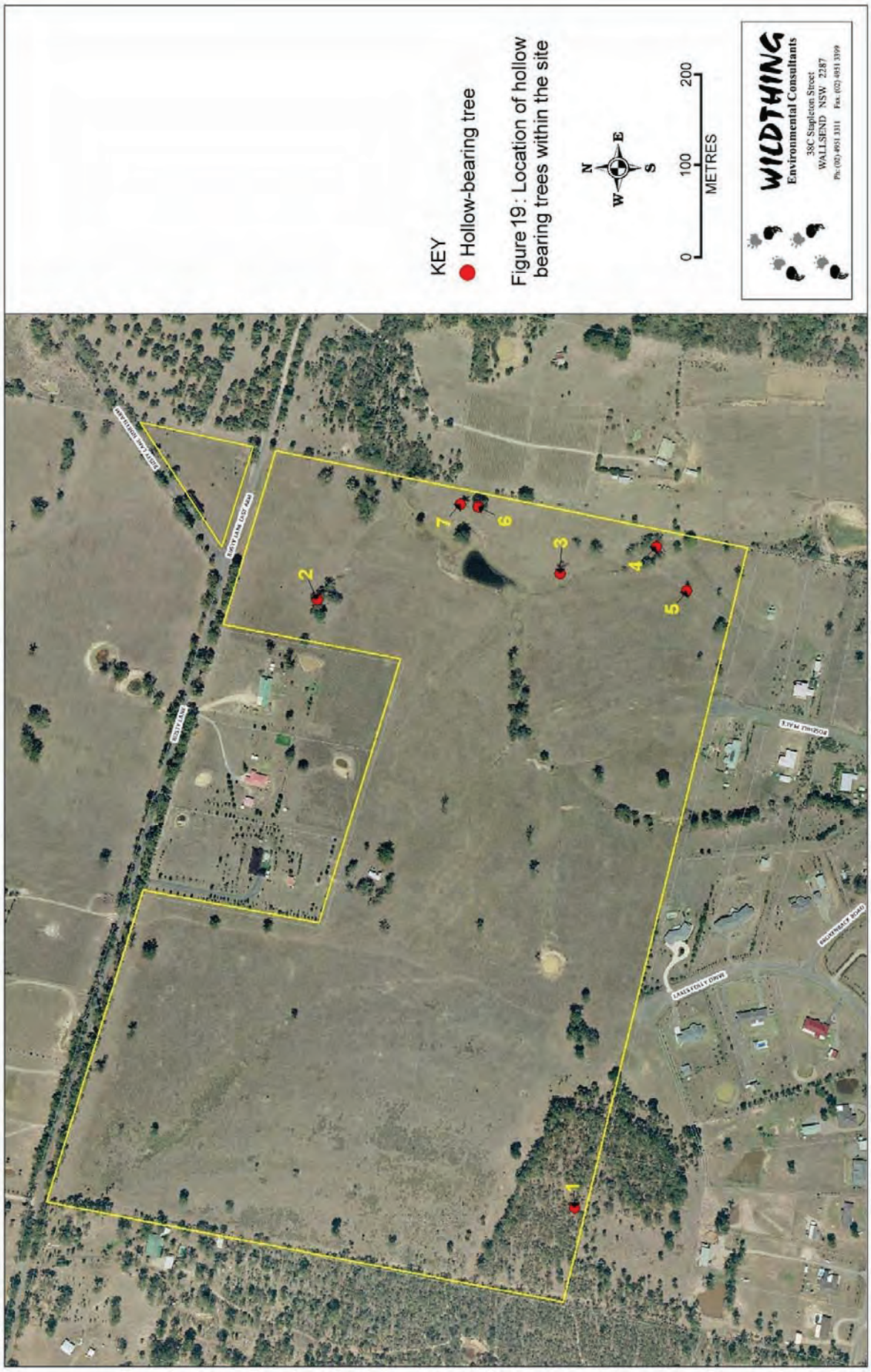
Seven hollow bearing trees were identified within the site. The classification system employed involved three classes:

Class 1 – large sized hollow openings (i.e. >15cm) suitable for species such as Owls
Class 2 – medium sized hollow-openings (i.e. 5-15cm) suitable for species such as Gliders and Possums
Class 3 – small sized hollow openings (i.e. <5cm) suitable for species such as microchiropteran bats.

The locations of the hollow trees are shown in Figure 19 and the results of the survey are displayed in Table 3.

Table 3: Hollow-bearing Tree Survey Results

Tree Number	Tree Type	Hollow Type
1	Eucalyptus crebra (Narrow-leaved Ironbark)	1 x Class 3 (Probable)
2	Angophora floribunda (Rough-barked Apple)	1 x Class 3
3	E. crebra	1 x Class 2 1 x Class 3
4	Eucalyptus tereticornis (Forest Red Gum)	1 x Class 3
5	E. crebra Tree half dead	1 x Class 3
6	E. crebra Large Tree Large hollow 4 metres off ground.	1 x Class 1 large hollow 4 metres off ground. 1 x Class 2 1 x Class 3
7	E. crebra Damaged at base openings in the form of cracks	1 x Class 3


KEY
Hollow-bearing tree
Figure 19 : Location of hollow bearing trees within the site
N
E
S
W
0
100
200
METRES
WILDTHING
Environmental Consultants
38C Stapleton Street
WALLSEND NSW 2287
Ph: (02) 4951 3311 Fax: (02) 4951 3399
1
2
3
4
5
6
7

4.3 HABITAT FOR SIGNIFICANT SPECIES

An assessment of habitat attributes on site has been undertaken for the threatened species that have been identified within 10km of the site on the DECC Database and the DEWHA on-line Database. The results of the assessment are displayed in Table 4.

Table 4: Habitat for Significant Species

Threatened Species	Status	Habitat Description and Locally Known Populations	Likelihood of Occurrence within Study Area
Cryptostylis hunteriana Leafless Tongue-orchid	TSC Act - E EPBC Act – E ROTAP– 3VC-	This species is a saprophtye which grows in small localised colonies on flat plains consisting of swamp-heath close to the coast. This species has also been recorded in mountainous areas growing in moist depressions as well as in swampy habitats	Low - Unlikely to be present on site due to the lack of preferred habitat and local records
Eucalyptus glaucina Slaty Red Gum	TSC Act – V	The Slaty Red Gum principally occurs in the Casino area in northern NSW and from Gloucester to Broke, in mid-northern NSW. It grows mostly on gentle slopes near drainage lines in alluvial and clayey soils, in open forest.	Moderate – Suitable habitat was considered to be present in the south-west of the site and particularly within the drainage lines.
Eucalyptus parramattensis spp. *decadens* Drooping Red Gum	TSC Act - V EPBC Act – V ROTAP – 2V_	Occurs in woodland on sandy soils in wet sites. In the Port Stephens area, the Drooping Red Gum occurs in open wet sclerophyll woodland on heavy, often waterlogged, inter-barrier depression soils.	Low - Areas of suitable habitat were found to be present within the south-west of the site. However the site would be considered to be north of the currently known distribution of this tree species.
Grevillea parviflora ssp. *parviflora*	TSC Act - V EPBC Act – V	Occurs in light clayey soils in woodlands. This Grevillea grows chiefly in south-western Sydney from Prospect to Thirlmere and Appin. Disjunct northern populations occur near Putty, Cessnock and Cooranbong (Fairly, 2004).	Low - Areas of suitable habitat were found to be present within the south-west of the site. However the site would be considered to be north of the currently known distribution of this tree species.
Persoonia pauciflora North Rothbury Persoonia	TSC – Critically Endangered. EPBC Act – V	Occurs in open forests and woodlands with a shrubby understorey on clay soils derived from silty sandstones. This species is only known to occur within one meta-population immediately south of the settlement of North Rothbury. Systematic surveys conducted in 1999 (Patrick, 1999) failed to find any further plants beyond 2km and within 5km radius of the type specimen (Patrick, 1999). No specimens were recorded during the vegetation survey of the nearby Belford National Park (Hill, L. & Peake, T. 2005).	Low-Moderate – Suitable habitat was present within the remnant in the south-west of the site. However the site is currently located outside the known population of this Persoonia species.
Acacia bynoeana Bynoe's Wattle	TSC Act - E EPBC Act – V	Found in heath, woodland and dry sclerophyll forests on sandy soils. Commonly associated species include *Eucalyptus haemastoma* (Scribbly Gum), *Corymbia*	Low - Areas of suitable habitat were found to be present within the south-west of the site. However the site would be considered to be north of the currently known

Threatened Species	Status	Habitat Description and Locally Known Populations	Likelihood of Occurrence within Study Area
		Eucalyptus haemastoma (Scribbly Gum), *Corymbia gummifera* (Red Bloodwood), *Angophora bakeri* and *Banksia spinulosa* (Hairpin Banksia). This species is known to occurs around Kurri Kurri however has been recorded off Littlewood Road at North Rothbury within Central Hunter and Lower Hunter Spotted Gum – Ironbark Forest (Harper Somers O'Sullivan, 2005).	be considered to be north of the currently known distribution of this wattle species.
Rutidosis heterogama Wrinklewort	TSC Act – V EPBC Act – V	Dry sclerophyll forest and woodland, as well as heath, sand dunes and in disturbed areas such as roadsides. This species has been found on the Central Coast and Lower Hunter Valley, particularly around Cessnock.	Low – Suitable habitat was confined to the area of remnant woodland in the south-west of the site. However the site would be considered to be north of the currently known distribution of this tree species.
Litoria aurea Green and Golden Bell Frog_	TSC Act - V EPBC Act - V	Swamps, lagoons, streams and ponds as well as dams, drains and storm water basins.	Low – Suitable habitat was present within the dams and ephemeral drainage lines within the site. This habitat is marginalised by the lack of recent local records and emergent aquatic vegetation.
Mixophyes balbus Stuttering Frog	TSC Act - E EPBC Act - V_	Prefers riparian vegetation or other moist vegetation communities, generally on rich organic soils. Deep leaf litter and/or thick cover is necessary for this species. Water quality must be of a high standard, and the species occurs in 1st to 3rd order streams (i.e. 'young' streams), and is absent from ponds and ephemeral pools.	Unlikely - No suitable habitat was present due to the lack of local records and younger order streams with high quality water on site.
Mixophyes iteratus Giant Barred Frog	TSC Act - E EPBC Act - V	Occurs on forest slopes of the Great Dividing Range, generally between 20-800m A.S.L. It appears to prefer riparian vegetation or other moist vegetation communities, generally on rich organic soils. Deep leaf litter and/or thick cover are necessary for this species.	Unlikely - No suitable habitat was present due to the lack of local records and younger order streams with high quality water on site.
Ephippiorhynchus asiaticus Black-necked Stork	TSC Act - E_	Inhabits swamps associated with river systems and large permanent pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds.	Low – Only marginal habitat would be available within the larger dam within the drainage line in the east of the site.
Rostratula benghalensis ssp. *australis* Australian Painted Snipe	TSC Act – E EPBC Act - V	The Australian Painted Snipe is usually found within marshes where there is moderate cover.	Low – Only marginal habitat would be available within the larger dam within the drainage line on site.
Calyptorhynchus lathami Glossy Black-Cockatoo	TSC Act - V	Prefers highland habitats in this part of its range but may be found closer to the coast where conditions are suitable. It forages primarily on the seeds of (Allo) Casuarina species, but will also take woodborers from large Acacia	Low – Foraging habitat was present within the drainage lines in the form of *Casuarina glauca* seed pods. Only marginal nesting habitat was present.

Threatened Species	Status	Habitat Description and Locally Known Populations	Likelihood of Occurrence within Study Area
		stems. It now appears to supplement its diet with the seeds of exotic pine trees.	
Lathamus discolor Swift Parrot	TSC Act - E EPBC Act - E	The Swift Parrot is a winter visitor to the mainland, preferring open forest to woodland. The preferred winter food species are *Eucalyptus sideroxylon* (Red Ironbark), *E. albens* (White Box), *E. ovata* (Swamp Gum), *E. robusta* (Swamp Mahogany) and *E. melliodora* (Yellow Gum). They have also been observed eating the seeds and flowers of *Xanthorrhoea* spp. (Grass Trees).	Moderate – Suitable foraging habitat in the form of flowering myrtaceous species was present within the site.
Neophema pulchella Turquoise Parrot	TSC Act – V	Lives on the edges of Eucalypt woodland adjoining clearings and on timbered ridges and creeks in farmland. It has also been recorded utilising roadside verges and orchards. Nests in small hollow branches of Eucalypts.	Moderate – Suitable foraging and limited nesting habitat was present within the site.
Xanthomyza phrygia Regent Honeyeater	TSC Act - E EPBC Act - E	This species is found in Open Forests and Woodlands, particularly in blossoming eucalypts and mistletoe	Low-moderate – Suitable foraging and nesting habitat was present in the form of flowering trees species particularly Spotted Gum.
Grantiella picta Painted Honeyeater	TSC Act - V	Nomadic, within a range of generally drier forested areas with mistletoes.	Low-moderate – Suitable foraging habitat was present in the form of a small number of seasonally fruiting mistletoes.
Pomatostomus temporalis ssp. *temporalis* Grey-crowned Babbler	TSC Act – V	Open forest, woodland, scrubland, farmland and outer suburbs. Prefers woodlands with regenerating trees, tall shrubs, and an intact ground cover of grass and forbs.	**High – This species was recorded on site.** Suitable foraging and nesting habitat was found to be present over the site particularly within the area of remnant woodland in the south-west.
Melithreptus gularis gularis Black-chinned Honeyeater	TSC Act - V	On the western side of the Great Dividing Range Found in drier sclerophyll forests and woodlands containing box-ironbark associations and River Red Gum. In the Hunter Valley this species is known to utilise drier coastal woodlands.	Low-moderate – Suitable foraging and nesting habitat was considered to be present within the site particularly in the area of remnant woodland in the south-west.
Climacteris picumnus victoriae Brown Treecreeper	TSC Act - V	This species is a medium sized insectivorous bird that occupies Eucalypt woodlands, particularly open woodlands lacking a dense understorey, River Red Gums on watercourses and around lakeshores. It is sedentary and nests in tree hollows within permanent territories.	Low-moderate – Suitable foraging and nesting habitat was present within the site particularly in the area of remnant woodland in the south-west.
Pyrrholaemus sagittatus Speckled Warbler	TSC Act - V	Specked Warblers live in a wide range of eucalypt-dominated vegetation that has a grassy understorey, often on rocky ridges or in gullies. It builds a domed nest of grass, bark shreds and moss, lined with fur on the ground.	Low-moderate – Suitable foraging and nesting habitat was present within the site particularly in the area of remnant woodland in the south-west.

Threatened Species	Status	Habitat Description and Locally Known Populations	Likelihood of Occurrence within Study Area
Lophoictinia isura Square-tailed Kite	TSC Act - V	The Square-tailed Kite inhabits Open Forests and Woodlands, particularly those on fertile soils with abundant passerines. They may also range into nearby open habitats but not into extensive treeless regions.	Low-moderate – Suitable habitat was present within the site.
Ninox connivens Barking Owl	TSC Act - V	This species is found in forest and woodland, encountered most commonly in savanna and paperbark woodlands. It sometimes roosts in rainforests, but it requires the more open country for hunting and hollow Eucalypts for breeding.	Low-moderate - Suitable hunting and nesting habitat was present within the site. Only marginal nesting habitat was thought to be present in the form of one larger hollow.
Ninox strenua Powerful Owl	TSC Act - V	A wide range of vegetation types from wet Eucalypt Forests with a Rainforest understorey to Dry Open Forests and Woodlands, large hollows for nesting.	Low-moderate - Suitable hunting and nesting habitat was present within the site. Only marginal nesting habitat was thought to be present in the form of one larger hollow.
Tyto novaehollandiae Masked Owl	TSC Act - V	Inhabits a range of wooded habitats that contain both mature trees for roosting and nesting and more open areas for hunting. Their diet comprises mainly ground-dwelling prey, including several species of native and introduced Rodent, Antechinus spp. and Bandicoots. On occasions, other prey such as Possums, Gliders and other birds are taken.	Low-moderate - Suitable hunting and nesting habitat was present within the site. Only marginal nesting habitat was thought to be present in the form of one larger hollow.
Dasyurus maculatus maculatus Tiger Quoll	TSC Act - V EPBC Act - E	Sclerophyll forests, rainforests and coastal woodlands. Caves and hollow logs required for nesting. Largely nocturnal, it may forage and bask in the sun during the day. Nests are made in rock caves and hollow logs or trees, and basking sites are usually found nearby. It is an opportunistic hunter of a variety of prey, including birds and their young, rats and other small terrestrial and arboreal mammals, gliders, small Macropods, reptiles and Arthropods. It also scavenges on the carcasses of domestic stock.	Low - Hunting and marginal nesting habitat was present.
Phascogale tapoatafa Brush-tailed Phascogale	TSC Act - V	Sparsely distributed outside the semi-arid zone in dry sclerophyll forest and monsoonal forest and woodland.	Low-moderate - Foraging and nesting habitat was available within the better quality areas of native vegetation in the south-west of the site.
Phascolarctos cinereus Koala	TSC Act - V	The Koala is limited to areas where there are acceptable food trees. Its diet is generally restricted to that of Eucalypt leaves and much less-often, non-Eucalypt foliage. The foliage of *E. tereticornis* (Forest Red Gum), *E. punctata* (Grey Gum), *E. robusta* (Swamp Mahogany)	Low - Habitat was present with the occurrence of a number of *Eucalyptus tereticornis* (Forest Red Gum) specimens - a recognised preferred Koala Food tree.

Threatened Species	Status	Habitat Description and Locally Known Populations	Likelihood of Occurrence within Study Area
		and *E. microcorys* (Tallowwood) are some of the preferred Eucalypt species.	
Petrogale penicillata Brush-tailed Rock-wallaby	TSC Act-E EPBC Act-E	The Brush-tailed Rock-wallaby is found in rocky sites in Sclerophyll Forests with a grassy understorey.	No habitat Present: The site lacks steep rocky habitat.
Petaurus norfolcensis Squirrel Glider	TSC Act - V	Dry sclerophyll forests and woodlands. This species eats a high proportion of invertebrates from the foliage of Eucalypts and Acacias supplemented by plant exudates in the form of Eucalypt and Melaleuca sap and Acacia gum. It requires tree hollows for nesting.	Low-moderate – Suitable habitat was considered to be present in the remnant woodland in the south-west of the site.
Pseudomys oralis Hastings River Mouse	TSC Act – V EPBC Act-V	Found at mid to high attitudes (to 1200m), mostly in damp, dense fern or sedge understorey along drainage lines, but also utilises drier areas with grassy or heathy ground cover.	Unlikely - Habitat is unlikely to be present due to the poor quality of remnant woodland, lack of dense foliage for refuge and relatively low altitude of the site.
Pteropus poliocephalus Grey-headed Flying-fox	TSC Act - V EPBC Act - V	Grey-headed Flying-foxes are known to occupy a variety of habitats, including wet and dry sclerophyll forests, rainforest, mangroves and paperbark swamps and Banksia woodlands. Here they forage on a range of fruits and blossoms. The predominant food source is Eucalypt blossom and fruits from trees such as *Ficus* spp. (Figs). As with most species of Flying-fox, P. poliocephalus roost communally in rainforest patches, mangroves, paperbark forests and modified vegetation in urban areas. They may move up to 70km from the camp each night to forage.	Moderate - The site contains foraging habitat for this species. Roosting habitat was not present.
Mormopterus norfolkensis Eastern Freetail Bat	TSC Act - V	This species utilises sclerophyll forest and woodlands hunting above the canopy and along ecotones. Tree hollows are used for roosting._	Moderate - Hunting habitat was present within the site. Roosting habitat was available within tree hollows and loose bark.
Falsistrellus tasmaniensis Eastern False Pipistrelle	TSC Act - V	Inhabits sclerophyll forests and has been observed roosting in holes and hollow trunks of Eucalypts.	Moderate - Hunting habitat was present within the site. Roosting habitat was available within tree hollows and loose bark.
Miniopterus australis Little Bentwing-bat	TSC Act - V	This species inhabits tropical rainforest to warm-temperate wet and dry sclerophyll forest occurring along the coastal plains and adjacent ranges from Cape York to the Hunter River. It is a sub-canopy hunter with a preference for well-timbered areas but it is also known to hunt in clearings adjacent to forests. Recorded roosts include caves, mines, stormwater drains, disused railway	Moderate - Hunting habitat is present over the site. Although roosting habitat is lacking due to the absence of caves or suitable structures. Non-preferred roosting habitat in the form of tree hollows was present.

Threatened Species	Status	Habitat Description and Locally Known Populations	Likelihood of Occurrence within Study Area
		tunnels and houses.	
Miniopterus schreibersii oceanensis Eastern Bentwing-bat	TSC Act - V	This is a cave (and similar man-made structures) roosting species, however it has been known to occasionally roost in tree hollows, that generally feeds above the forest canopy in wet and dry tall open forest, catching insects on the wing. However, the species has also been recorded utilising rainforest, monsoon forest, open woodland, paperbark forests and open grasslands. Moths are the main prey item.	Moderate - Hunting habitat is present over the site. Although roosting habitat is lacking due to the absence of caves or suitable structures. Non-preferred roosting habitat in the form of tree hollows was present.
Myotis adversus Large-footed Myotis	TSC Act - V	The Large-footed Myotis is found in various habitats along the coast. It is a small bat that hunts by raking the surface of the water for aquatic insects and small fish, it seldom occurs far from suitable water bodies which range from rainforest streams to large reservoirs and even brackish water. Some aerial hunting also occurs. Recorded roosts include caves, mines and disused railway tunnels as well as dense rainforest foliage in the tropical parts of its range. Some occurrences of roosting in tree hollows are also noted.	Moderate - Hunting habitat is available over the dams and creeklines on site. Potential non-preferred roosting habitat in the form of tree hollows was present.
Scoteanax rueppellii Greater Broad-nosed Bat	TSC Act - V	The Greater Broad-nosed Bat occurs only along the eastern coastal strip of Queensland and NSW where it is restricted to the coast and adjacent areas of the Great Dividing Range found at low altitudes (below 500m). S. rueppellii is known to hunt along tree-lined creeks, the junction of woodland and cleared paddocks, and low along rainforest creeks. It may have a preference for wet gullies in tall timber country. The species roosts mainly in tree hollows but it has also been found in the roof spaces of old buildings.	Moderate - Hunting habitat is present over the site. Although roosting habitat is lacking due to the absence of caves or suitable structures. Non-preferred roosting habitat in the form of tree hollows was present.
Chalinolobus dwyeri Large-eared Pied Bat	TSC Act - V EPBC Act - V	Uncommon in dry and wet eucalypt forests. Roosts by day in caves, mines, and abandoned mud-nests and feeds on insects. There is a lack of local records for this species.	Low - Hunting habitat is present within the site, although roosting habitat is lacking due to the absence of caves or suitable structures.
Vespadelus troughtoni (Eastern Cave Bat)	TSC Act - V	The Eastern Cave Bat roosts in caves and occurs in wet/dry sclerophyll forests to the semi arid zone. It has been found roosting in small groups in sandstone overhangs, in mine tunnels and occasionally buildings.	Low - Hunting habitat is present within the site, although roosting habitat is lacking due to the absence of caves or suitable structures.

4.4 FAUNA SURVEY RESULTS

4.4.1 DIURNAL SURVEYS

Avifauna Survey

Avifauna species occurring on most of the site were those adapted to open agricultural pasture areas requiring few trees such as *Gymnorhina tibicen* (Magpie), *Grallina cyanoleuca* (Magpie-lark), *Cracticus nigrogularis* (Pied Butcherbird), *Rhipidura leucophrys* (Willie Wagtail) and *Platycercus eximius* (Eastern Rosella). A group of approximately eight specimens of *Pomatostomus temporalis temporalis* (Grey-crowned Babbler) were observed within a remnant tree in the north-west of the site. The Grey-crowned Babbler is listed as vulnerable under the TSC Act (1995) and has been further addressed in Section 5.0 of this report.

Additional birds recorded within the remnant woodland in the south-west of the site included *Manorina melanocephala* (Noisy Miner), *Coracina novaehollandiae* (Black-faced Cuckoo-shrike) and *Cracticus torquatus* (Grey Butcherbird).

A small number of waterbirds were found to be present within the larger dam and drainage line in the east of the site. Species observed included *Egretta novaehollandiae* (White-faced Heron), *Chenonetta jubata* (Australian Wood Duck) and *Gallinula tenebrosa* (Dusky Moorhen). A platform of bent reeds in the centre of the larger dam were thought to be evidence of recent nesting by the pair of Dusky Moorhen present.

Also there was:

- No sign of chewed Casuarina or Pinecones evident within or in close proximity to the site, which may indicate the presence of *Calyptorhynchus lathami* (Glossy Black Cockatoo).
- No whitewash, regurgitation pellets or prey remains consistent with Owls noted.

A full list of the birds identified during the fieldwork is contained in the Expected Fauna Species List in Appendix D. No other observed bird species are recognised as being threatened under the Threatened Species Conservation Act (1995) or the Environment Protection and Biodiversity Conservation Act (1999).

Reptile Survey

Carlia tetradactyla (Southern Rainbow Skink) was commonly recorded within the remnant woodland in the south-west of the site. This reptile species is not listed as threatened. No other reptile species were noted on site.

4.4.2 NOCTURNAL SURVEYS

Spotlighting survey

A mob of *Macropus giganteus* (Eastern Grey Kangaroo) was observed grazing on site during spotlighting. This macropod species was also observed within the site during diurnal observations. The introduced *Lepus capensis* (European Hare) was also commonly observed.

Amphibian Survey

Six species of frog, *Limnodynastes tasmaniensis* (Spotted Grass Frog), *Crinia signifera* (Eastern Toadlet), *Litoria fallax* (Dwarf Tree Frog), *Litoria latopalmata* (Broad-palmed Frog), *Uperoleia laevigata* (Smooth Toadlet) and *Limnodynastes peronii* (Striped Marsh Frog) were recorded within the drainage lines and dams during the survey. These amphibian species are not listed as threatened.

There was no response to the *Litoria aurea* (Green and Golden Bell Frog) playback surveys undertaken.

Microchiropteran Bat Survey

The audible *Nyctinomus australis* (White-striped Freetail-bat) was heard flying above the site during the survey. Calls consistent with both *Chalinolobus gouldii* (Gould's Wattled-bat) and *Mormopterus* sp. 2 were also recorded during the bat call survey. These bats are not recognised as threatened under state and national legislation.

Incidental observations

One introduced fish species, *Gambusia holbrooki* (Plague Minnow) were found to be present within the larger body of water in the east of the site. The occurrence of the Plague Minnow is listed as a threatening process under the NSW Threatened Species and Conservation Act, 1995.

4.4.3 SURVEY LIMITATIONS

As with all reports of this type the main limitation for the survey is considered to be the short period of time in which the fieldwork was carried out during two sessions. Limitations to the likelihood of detecting certain subject species were also encountered during this survey. Such limitations were generally related to the seasonal detectability of species, be it as a result of known flowering periods for flora or migratory movements by fauna. For example, the Swift Parrot nests in Tasmania during the warmer months of the year and would be unlikely to be present in the region at the time of the survey. The hot dry weather experienced on a number of days before the survey had dried the vegetated understorey making it difficult to identify a number of the flora species, particularly grasses.

These limitations have been overcome by applying the precautionary principle in all cases where the survey methodology may have given a false negative result. This precautionary principle was achieved by recognising that most threatened species are rare and therefore unlikely to be encountered during a survey even if they may utilise the site at other times. These species have been assessed on the basis of the presence of their habitat and the likely significance of that habitat to a viable local population.

5.0 THREATENED SPECIES AND ENDANGERED ECOLOGICAL COMMUNITIES ASSESSMENT

Approximately 2 hectares of remnant woodland in the south-west corner of the site was found to be consistent with the Endangered Ecological Community, Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion (NPWS, 2005). The remnant has been subject to a number of disturbances from past vegetation clearance and cattle grazing. A smaller nearby island of highly disturbed Lower Hunter Spotted Gum – Ironbark Forest approximately 0.1ha in size was also present to the west of the remnant. It is recommended that the larger remnant be left in-situ as part of any future development. A buffer between any development and the woodland remnant would most likely be required to meet bushfire regulations.

Highly disturbed remnant riparian vegetation contained within the drainage lines in the eastern portion of the site was found to contain flora species common to two locally occurring Ecological Communities, Hunter Lowlands Red Gum Forest (Peake, 2005 & NPWS, 2000) and Central Hunter Swamp Oak Forest (Peake, 2005). Hunter Lowlands Red Gum Forest in the Sydney Basin Bioregion (NPWS, 2000) is listed as an Endangered Ecological Community. Although highly disturbed it is recommended that these remnants are also left in-situ within any development within the site. A buffer between any development and most of the ephemeral drainage lines would be expected to be set aside to meet the requirements of the DECC.

Habitat for a number of threatened species addressed had largely been removed from the site as a result of historical vegetation clearance and continued grazing. The remaining habitat with the exception of the 2 hectare area of remnant woodland and the drainage lines and larger dam in the east of the site would only provide resources for those species adapted to a disturbed open habitat.

No threatened flora species were recorded during the survey, despite limited suitable habitat being available for a number of the assessed species. Habitat was considered to be available for six of the seven threatened flora species assessed:

- *Eucalyptus glaucina* Slaty Red Gum
- *Eucalyptus parramattensis* ssp. *decadens* Drooping Red Gum
- **Grevillea parviflora* ssp. *parviflora* Grevillea
- *Acacia bynoeana* Bynoe's Wattle
- **Rutidosis heterogama* Wrinklewort
- *Persoonia pauciflora* North Rothbury Persoonia

The area of remnant woodland was considered to provide some potential habitat for all of these threatened flora species. Suitable habitat for *E. glaucina* was also considered to be available within the drainage lines on site. With the exception of *Eucalyptus glaucina* the site is currently considered to be outside the known local range for the remaining threatened species.

One threatened species, *Pomatostomus temporalis temporalis* (Grey-crowned Babbler), was recorded within the site during the survey with a family group of up to ten individuals observed in a remnant tree in the north-west of the site. The family group had entered the site from the vegetated road reserve which runs along Rusty Lane in the north and then moved into the adjoining rural residential lot. Suitable foraging and nesting habitat was present within the area of remnant woodland within the south-west of the site and to a lesser extant the remnant scattered and clumped trees. No brood or roost nests were recorded within the site during the survey. It is thought that at least one family group utilises the site for foraging purposes and would not solely rely on the resources contained within the site for survival.

Any future development within the site has the potential to impact on the local population of Grey-crowned Babblers. However this species is known to be tolerant of modified habitats to a degree and would be likely to utilise retained areas within the site such as the area of remnant woodland and vegetated areas within the drainage line. It would be recommended that any new landowners control threats such as domestic cats. Considering the presence of larger areas of suitable habitat outside the site and recommendations including retaining habitat and cat control it is considered unlikely that the proposed rezoning would cause the local extinction of this bird species.

Habitat was considered to be available for 24 of the 32 remaining threatened fauna species addressed.

Litoria aurea	Green and Gold Bell Frog
Ephippiorhynchus asiaticus	Black-necked Stork
Rostratula benghalensis australis	Australian Painted Snipe
Calyptorhynchus lathami	Glossy Black Cockatoo
Lathamus discolor	Swift Parrot
Neophema pulchella	Turquoise Parrot
Climacteris picumnus victoriae	Brown Treecreeper
Pyrrholaemus sagittatus	Speckled Warbler
Xanthomyza phrygia	Regent Honeyeater
Melithreptus gularis gularis	Black-chinned Honeyeater
Grantiella picta	Painted Honeyeater
Lophoictinia isura	Square-tailed Kite
Ninox connivens	Barking Owl
Ninox strenua	Powerful Owl
Tyto novaehollandiae	Masked Owl
Phascogale tapoatafa	Brush-Tailed Phascogale
Pteropus poliocephalus	Grey-headed Flying-Fox
Falsistrellus tasmaniensis	Eastern Falsistrelle
Chalinolobus dwyeri	Large Pied Bat
Miniopterus australis	Little Bentwing-bat
Miniopterus schreibersii oceanensis	Large Bentwing-bat
Myotis adversus	Large Footed Myotis
Scoteanax rueppellii	Greater Broad-nosed Bat
Vespadelus troughtonii	Eastern Cave Bat

The area of remnant woodland and drainage lines were considered to provide suitable habitat for a

number of the species assessed. However the majority of the site contained habitat only suitable for those species adapted to a disturbed open areas with few isolated trees. Taking into consideration the recommendations of protecting the area of remnant woodland and vegetated drainage lines within the site the rezoning and subsequent development is unlikely to result in the loss of a viable endangered ecological community or local population of any of the threatened species considered in this report.

6.0 STATE ENVIRONMENTAL PLANNING POLICY 44 – KOALA HABITAT PROTECTION

The principal aim of State Environment Planning Policy 44 - Koala Habitat Protection, is 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 to reverse the current trend of Koala population decline.

This policy applies to areas of more than one hectare or an area, which has together with any adjoining land in the same ownership an area of more than 1 hectare, whether or not the development application applies to the whole, or only part of the land.

6.1 FIRST CONSIDERATION – IS THE LAND 'POTENTIAL KOALA HABITAT'?

'Potential Koala Habitat' is defined as, "…an area of native vegetation where trees of the type listed in Schedule 2 (Koala feed tree species) constitute at least 15% of the total number of trees in the upper and lower strata of the tree component."

One species of 'Koala Feed Tree' was identified on site, being *Eucalyptus tereticornis* (Forest Red Gum). This tree species did not constitute greater than 15% of the total number of trees contained within the site. Therefore the site would not be considered to constitute 'Potential Koala Habitat'. No direct observations of Koalas or evidence of Koala activity such as scats and scratches on the boles of tree was recorded despite targeted searches. Due to the lack of recent local records, it is unlikely the Koala occurs within the local area. Therefore no further provisions of this policy apply to the site.

7.0 CONSIDERATION OF THE COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

Considerations have been made to the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1999. Assessments have been made to determine whether or not the proposal or activity has, will have, or is likely to have a significant impact on a matter of National Environmental Significance. The matters of National Environmental Significance and the appropriate responses are listed below:

- *World Heritage properties;*

The study area is not affected by World Heritage listing, nor is it likely to impact upon any World Heritage area.

- *wetlands recognised under the Ramsar convention as having international significance;*

The site is located within the Hunter River Catchment which flows into the Hunter Estuary Wetlands. Provided that erosion and sediment control measures are implemented it is unlikely that any future proposal will have an impact upon this wetland.

Eighteen nationally threatened species were recorded on DEWHA on-line database as occurring or having potential habitat available within 10km of the site, these being:

Cryptostylis hunteriana	Leafless Tongue Orchid
Eucalyptus glaucina	Slaty Red Gum
Eucalyptus parramattensis ssp. *decadens*	Drooping Red Gum
Grevillea parviflora ssp. *parviflora*	Small-flowered Grevillea
Rutidosis heterogama	Wrinklewort
Persoonia pauciflora	North Rothbury Persoonia
Litoria aurea	Green and Golden Bell Frog
Mixophyes balbus	Stuttering Frog
Mixophyes iteratus	Southern Barred Frog
Rostratula benghalensis	Painted Snipe
Xanthomyza phrygia	Regent Honeyeater
Lathamus discolor	Swift Parrot
Dasyurus maculatus maculatus	Tiger Quoll
Petrogale penicillata	Brush-tailed Rock-Wallaby
Potorous tridactylus tridactylus	Long-nosed Potoroo
Pseudomys oralis	Hastings River Mouse
Pteropus poliocephalus	Grey-headed Flying-fox
Chalinolobus dwyeri	Large Pied Bat

Based on the results of the fieldwork, habitat assessment and given recommendations it is considered unlikely that the above eighteen species would place any constraints on the potential development of the site.

Thirteen migratory species were recorded on the DEWHA on-line database as occurring or having potential habitat available within 10km of the site, these being:

Haliaeetus leucogaster	White-bellied Sea-Eagle
Hirundapus caudacutus	White-throated Needletail
Xanthomyza phrygia	Regent Honeyeater
Monarcha melanopsis	Black-faced Monarch
Monarcha trivirgatus	Spectacled Monarch
Myiagra cyanoleuca	Satin Flycatcher
Rhipidura rufifrons	Rufous Fantail
Merops ornatus	Rainbow Bee-eater
Ardea alba	Great Egret
Ardea ibis	Cattle Egret
Gallinago hardwickii	Latham's Snipe
Rostratula benghalensis australis	Painted Snipe
Apus pacificus	Fork-tailed Swift

None of these migratory species were recorded during the survey. The proposal is unlikely to have a significant impact on any of these species.

- *nuclear activities;*

The proposal does not involve any type of nuclear activity.

- *the Commonwealth marine environment;*

The proposal does not involve the modification of the Commonwealth marine environment.

In conclusion it is considered that any future development within the site is unlikely to be significantly constrained by a matter of National Environmental Significance.

8.0 SUMMARY OF ECOLOGICAL CONSTRAINTS

A summary of the potential ecological constraints to the rezoning of the site provided throughout the report is summarised below.

Endangered Ecological Communities

Lower Hunter Spotted Gum – Ironbark Forest

Approximately 2 hectares of Lower Hunter Spotted Gum – Ironbark Forest was found to be present in the south-west corner of the site. A smaller 0.1ha area of Lower Hunter Spotted Gum – Ironbark Forest was also found to be present a short distance to the east of the larger remnant. The remnants (particularly the smaller remnant) have been subject to a number of disturbances from past vegetation clearance and cattle grazing. Despite the disturbances the larger remnant was found to be in generally good condition and relatively free of weed species. It is recommended that the larger remnant at least be left untouched within any future development and protected by means of a covenant or similar planning instrument. A buffer between any development and the woodland remnant would most likely be required to meet bushfire regulations.

Hunter Lowlands Red Gum Forest

Although highly disturbed the small remnant areas of riparian vegetation within the drainage lines in the eastern portion of the site was found to contain flora species common to one locally occurring Endangered Ecological Community Hunter Lowlands Red Gum Forest (Peake, 2005 & NPWS, 2000). It is recommended that the remnants of the riparian vegetation be left in-situ within the drainage line in any future development. It is expected that a buffer between any development and the ephemeral drainage lines would be set aside to meet the requirements of the DECC.

Habitat trees

Seven hollow-bearing trees were found to be present within the site. It is recommended that these trees be left in-situ within any future development. If any hollow-bearing tree are required to be removed compensatory nestboxes will need to be erected in their place.

Threatened Species

Flora

No threatened flora species were found on site during the survey. Due to the high degree of disturbance over the majority of the site suitable habitat was considered to be largely confined to the woodland remnant in the SW of the site and parts of the drainage lines.

Fauna

One threatened fauna species, *Pomatostomus temporalis temporalis* (Grey-crowned Babbler) was found to utilise the site during the survey. Any future development within the site has the potential to impact on the local population of Grey-crowned Babblers. However this species is known to be

tolerant of modified habitats to a degree and would be likely to utilise retained areas within the site such as the area of remnant woodland and vegetated areas within the drainage line. Considering the presence of larger areas of suitable adjoining habitat outside the site and recommendations including retaining habitat and cat control it is considered unlikely that the proposed rezoning would cause the local extinction of this bird species.

Rare Flora Species

Grevillea montana

A number of individuals of *Grevillea montana,* a ROTAP species, was found to be present in the western portion of the 2 hectare remnant of woodland. A small number of plants were also observed within the adjacent cleared area of the site. This species has been increasingly recorded in recent years which suggest the revision of the ROTAP code of 2KC- to 2Rca (Bell, 2001). The conservation of the woodland area would protect the majority of *G. montana* specimens on site.

9.0 CONCLUSION

The flora, habitat and fauna assessments over approximately 43ha of land known as Lot 404 DP 866648 & Lot 1 DP 1060691 Rusty Lane, Branxton, NSW, were undertaken to highlight the issues, particularly in relation to threatened species, that may pose constraints to the rezoning and future development of the site.

The site was found to be largely cleared of native vegetation and has been used as a grazing property for a considerable period of time. Despite the disturbance a 2ha area of remnant of woodland was present in the south-west corner of the site and a small amount of remnant riparian vegetation was present along the drainage lines. The 2ha remnant of woodland was found to be consistent with the Endangered Ecological Community listed in Part 3 of Schedule 1 of the TSC Act (1995), being Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion (NPWS, 2005).

No threatened flora species were recorded during the survey, however the site was considered to provide habitat for a number of addressed species such as *Eucalyptus glaucina* (Slaty Gum). One rare flora species, *Grevillea montana,* was found to be present in the western portion of the 2 hectare remnant of woodland. The proposal is unlikely to result in a significant loss of this species.

One threatened species, *Pomatostomus temporalis temporalis* (Grey-crowned Babbler) was found to utilise the site during the survey. Suitable habitat was also considered to be available for 26 of the 30 addressed species within the site. Any future development may result in a small reduction of habitat for a number of threatened species, however it would not be considered to be significant in the local area.

Consideration of State Environmental Planning Policy 44 – Koala Habitat Protection, identified one species of 'Koala Feed Tree' on site, *Eucalyptus tereticornis* (Forest Red Gum). This tree species did not constitute greater than 15% of the total number of trees contained within the site. Therefore the site would not be considered to constitute 'Potential Koala Habitat'.

Considerations have been made to the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1999. It was determined that the proposed works are unlikely to have a significant impact on a matter of National Environmental Significance.

Taking into consideration the recommendations, such as the retainment of the larger remnant in the south-west corner of the site and native vegetation within the drainage lines it is unlikely that any future development will result in the loss of a viable local population of any threatened species or Endangered Ecological Community.

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APPENDIX A

THREATENED SPECIES DESCRIPTIONS

1. *Cryptostylis hunteriana* Leafless Tongue-Orchid

Cryptostylis hunteriana, of the family Orchidaceae, is a distinctive species recognised by its leafless habit and reddish black hairy labellum with a central, raised, hairy callus. The Leafless Tongue Orchid occurs from the Gibraltar Range (N.S.W) to eastern Victoria. This species is a saprophtye which grows in small localised colonies on flat plains close to the coast. This species has also been recorded in mountainous areas growing in moist depressions as well as in swampy habitats. Flowering time is December - February. This species is ROTAP-coded 3VC-.

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2. *Eucalyptus glaucina* Slaty Red Gum

Eucalyptus glaucina occurs as a tree, often to 18m, sometimes to 30m. The bark is smooth throughout, white or grey. Juvenile leaves are ovate, pale green or glaucous and slightly discolorous. Adult leaves are lanceolate to broadly lanceolate, acuminate and moderately thick. Fruits are hemispherical or ovoid, 7-10mm long, 7-10mm wide; disc broad, ascending; valves 3-5. The seeds are brown-black.

The Slaty Red Gum principally occurs in the Casino area in northern NSW and from Gloucester to Taree, in mid-northern NSW. It grows mostly on gentle slopes near drainage lines in alluvial and clayey soils, in open forest. It is closely aligned with *E. tereticornis* (Forest Red Gum), but distinguished by the glaucous buds. This species is ROTAP-coded 3VCa.

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3. *Eucalyptus parramattensis* ssp. *decadens* Drooping Red Gum

Eucalyptus parramattensis ssp. *decadens* is distributed across the lower Hunter Valley (N.S.W) from Tomago to Kurri Kurri. It occurs in woodland on sandy soils in wet sites. Any occurrences are likely to be restricted to areas along riparian vegetation strips or within close proximity to the water table. In the Port Stephens area, the Drooping Red Gum occurs in open wet sclerophyll woodland on heavy, often waterlogged, interbarrier depression soils. It is distinguished from *E. p. parramattensis* by the larger fruit, which are greater than 7mm in diameter. It is commonly associated with *Melaleuca quinquenervia* (Broad-leaved Paperbark) and *Eucalyptus robusta* (Swamp Mahogany). This sub-species is ROTAP listed 2V.

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4. *Grevillea parviflora* ssp. *parviflora* Small-flowered Grevillea

Grevillea parviflora ssp. *parviflora* is distributed from Prospect to Camden and Appin, with disjunct northern populations occurring near Putty, Cessnock and Cooranbong. This species is a low open to erect shrub, 0.3-1m tall. Flowering time is from July to October. It occurs in light clayey soils in woodlands. This sub-species is not ROTAP-listed.

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5. *Acacia bynoeana* Bynoe's Wattle

Acacia bynoeana occurs from Morisset (lower Hunter Valley) to Mittagong. This species is an erect or spreading shrub, 0.2-1m high (Harden 1991). It's found in heath, woodland and dry sclerophyll forests on sandy soils derived from Hawkesbury Sandstone. Commonly associated species include *Eucalyptus haemastoma* (Scribbly Gum)*, Corymbia gummifera* (Red Bloodwood)*, Angophora bakeri, Banksia spinulosa* (Hairpin Banksia)*, B serrata* (Old Man Banksia)*, Acacia oxycedrus* and *Kunzea* spp. It is considered to be uncommon, but scattered populations have been noted throughout the Sydney region. This species can be recognised by the rough coarse hairs covering the branchlets and the phyllodes, and the thick and resinous phyllodes with parallel veins. Flowering occurs during the summer months and is characterised by a bright yellow, globular single flower located within the leaf axil. This species has been ROTAP-coded 3VC- and has recently (March 2000) been upgraded from 'Vulnerable' to 'Endangered' under the TSC Act 1995. Conserved populations occur within the Blue Mountains National Park and the Royal National Park, though the exact size of these populations is unknown.

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6. *Rutidosis heterogama* Wrinklewort

Rutidosis heterogama is a perennial herb and a member of the Asteraceae family. It grows to 30cm tall from a woody base. The leaves are rough, narrow and stalkless, measuring up to 3.5cm long. The flowerhead is yellow and has 6 to 8 rows of shiny and translucent golden-tawny scales, usually flowering in Autumn. It has been recorded on the north coast and northern tablelands, mainly in coastal districts from Maclean to the Hunter Valley and inland to Torrington. Populations of this species have been recently recorded in the Kurri Kurri and Cooranbong areas (Stevenson, 2004). The population identified at Cooranbong was found to comprise of over 2000 specimens. Found growing in dry sclerophyll forest and woodland, as well as heath, sand dunes and in disturbed areas such as roadsides. This species has been

recorded in the Kurri Sand Swamp Woodland, as well as in Lower Hunter Spotted Gum Ironbark Forest.

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7. *Persoonia pauciflora* North Rothbury Persoonia

Persoonia pauciflora, a member of the Proteaceae family, is a recently discovered species known from only a small area near North Rothbury, in the Hunter Valley. This species was formerly referred to as *Persoonia* sp. North Rothbury. It is a spreading shrub that grows to 1.4m tall and 2.0m wide, with smooth greyish bark and alternate linear bright-green, needle-like leaves that display hairs when immature. The dull yellow flowers grow from terminal or lateral buds with a single ovule. The drupes are dull green with reddish purple striations.

Persoonia pauciflora most closely resembles *P. isophylla* and *P. pinifolia,* although it has fewer flowers on a shorter inflorescence. This species occurs in open forests and woodlands with a shrubby understorey on clay soils derived from silty sandstones. The key threats to the *P. pauciflora*, which has a total known population of approximately 400 plants, is grazing and clearing pressures, leading to habitat degradation, fragmentation and loss. No specimens are known to occur within the reserve system and the species is not ROTAP-listed.

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8. *Litoria aurea* Green and Golden Bell Frog

Litoria aurea was formerly known to inhabit the eastern seaboard of New South Wales and Victoria from Byron Bay through to the Gippsland Lake Region as well as highland sites (New England District, south-western slopes of N.S.W. and Monaro District). Recent literature indicates that the northern and southern distribution limits have not changed, however, *L. aurea* is no longer found on sites above an altitude of 300m above sea level. This frog species inhabits swamps, lagoons, streams and ponds as well as dams, drains and storm water basins. *L. aurea* is thought to be displaced from more established sites by other frog species thus explaining its existence on disturbed sites.

The Green and Golden Bell Frog is a summer breeder and voraciously cannibalistic. The males call from August through to January using a distinctive four part call: "crawk-awk, crawk, crok, crok". The common name of *L. aurea* is derived from its body colouration described as being dull olive to bright emerald green above with blotches of brown or golden-bronze.

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9. *Mixophyes balbus* Stuttering Frog

A large stout frog that occurs in wet forest regions of South-Eastern Queensland, Eastern NSW and Victoria. Male frogs reach a size of 60-63mm, while females are larger at 74-80mm. The call of this species is described as a short, soft grating trill of about 10 pulses.

The dorsal surface is brown to olive green and finely granular. A dark irregular mid-dorsal band extends to the rear from between the eyes. There is a pale blue crescent on the upper eyelid. In late spring, eggs are deposited among leaf litter on the banks of streams are washed into the water during heavy rain. The large tadpoles (65mm) have flattened bodies with narrow fins.

Clearing of habitat, declining water quality and introduced predators such as *Gambusia holbrooki* (Plague Minnow) and *Cyprinus carpio* (Carp) are all thought likely to be contributing to the decline of this species.

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10. *Mixophyes iteratus* Great Barred Frog

Also known as the Gold-eyed Barred Frog, this species has been found from near Narooma on the south coast of NSW northwards along the eastern escarpment of the Great Dividing Range and coastal region to the Conondale Ranges in south-eastern QLD. However, this species has not been detected in the far south of its range in recent times, and has been

observed to be in decline over the last 15 years. Some recent records exist for the species near Boarding House Dam, in the Watagan Mountains (Mahony pers. comm.).

Mixophyes iteratus occurs on forest slopes of the Great Dividing Range, generally between 20-800m A.S.L. It appears to prefer riparian vegetation or other moist vegetation communities, generally on rich organic soils. Deep leaf litter and/or thick cover is necessary for this species. It appears tolerant of invasion of suitable habitat by weeds such as Lantana. Water quality must be of a high standard, and the species occurs in 1st to 3rd order streams (i.e. 'young' streams), and is absent from ponds and ephemeral pools. Graded banks with undercuts and steep edges are favourable haunts of this frog.

Mixophyes iteratus is the largest frog in the *Mixophyes* genus, with Males reaching a size of 68-78mm, while females are larger at 91-108mm. The call of this species is described as a 'deep guttural grunt', and calling is typically from leaf litter along the banks of streams. The eggs are also laid there, to be washed into the water later by heavy rains. All known breeding seems to be in late spring and early summer.

Clearing of habitat, declining water quality and introduced predators such as *Gambusia holbrooki* (Plague Minnow) and *Cyprinus carpio* (Carp) are all thought likely to be contributing to the decline of this species. However, the apparent disappearance of this species from 'pristine' areas cannot be accounted for at this point in time.

11. *Ephippiorhynchus asiaticus* Black-necked Stork

The Black-necked Stork, formerly known as the Jabiru, ranges through India, south-eastern Asia, southern New Guinea and into northern and eastern Australia. It was known in the Sydney district when settlement was established, disappeared by the 1850s and began to recolonise from about 1930. There is nothing to suggest that the Black-necked Stork in Australia makes seasonal movements, though it is capable of moving long distances and turning up far from breeding grounds. The Black-necked Stork is often in pairs and occasionally in parties of up to 18. Sexes are alike, apart from the eye, which is yellow in the female and black in the male.

It usually inhabits swamps associated with river systems and large permanent pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds. There are no studies of banded birds but it may be that an individual, having once settled in a locality, remains for many years. The species fly high and straight with slow, deliberate wingbeats and the birds are generally seen stalking quietly about seeking its prey, every now and again taking great strides and jabbing at fish with its bill. The bird feeds on fish, frogs, crabs, carrion and possibly rats. Nests are usually found in low trees in swamps or in tall forest trees but may be occasionally on the ground.

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12. *Rostratula benghalensis australis* Painted Snipe

The Painted Snipe ranges through Africa, India, China, south-eastern Asia and the Pacific. It is usually found in pairs, frequenting the margins of swamps and streams, chiefly those covered with low and stunted vegetation. It probes in mud along the shore to gather snails, water insects and aquatic plants. When flushed, it flies close to the ground, making for the nearest cover, and is then exceedingly difficult to flush again. The Painted Snipe appears to be nomadic, with movements mainly north in winter and south in summer. It requires shallow fresh water for breeding, though the nest is not deserted if the water dries up. Nests are usually in groups, and consist of a shallow depression in the ground, lined with grass or leaves and frequently sheltered by a low bush or tuft of grass. Nests have been recorded at a density of 24 nests/ha but other smaller colonies have had distances of 15-50 m between nests.

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13. *Calyptorhynchus lathami* Glossy Black-Cockatoo

The Glossy Black-Cockatoo inhabits Wet and Dry Sclerophyll Forests and Woodlands of eastern Victoria to central Queensland, extending to the western slopes in New South Wales. A subspecies, *C. l. halmaturinus* exists on Kangaroo Island, South Australia. It prefers highland habitats in the northern part of its range but may be found closer to the coast when and where conditions are suitable. In the south they are widespread in lowland coastal forests, dense mountain forests, semi-arid woodland and trees bordering watercourses.

Glossy Black-Cockatoos forages primarily on the seeds of (*Allo*)*Casuarina* species, but will also take wood borers from large *Acacia* stems. *Allocasuarina torulosa, A. verticillata* and *A. littoralis* are the predominant food trees in NSW. On Kangaroo Island, *Casuarina stricta* is the predominant food source. They have also been observed eating *Angophora, Acacia* and *Eucalyptus* seeds. It now appears to supplement its diet with the seeds of exotic pine trees. A

sign that foraging individuals have recently fed at a site is a scattering of leaves, twigs and freshly chewed cones under the (*Allo*)*Casuarina* trees. While feeding they are tame and relatively easy to approach. Flocks of Glossy Black-Cockatoos have been seen but are not common. They are usually seen in pairs or threes (being a pair and their young), or as feeding groups consisting of 10-12 birds that are likely to be loose family aggregations. Such groups seem to occupy an area permanently and have a distinctive flight pattern of slow, shallow wing-beats. Nesting takes place from March through August in the hollows of large Eucalypts, 10-20m above the ground, where a single egg is laid.

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14. *Lathamus discolor* Swift Parrot

The Swift Parrot is most closely related to Rosellas, though its habits are most closely aligned with those of the Lorikeets, which it also resembles morphologically. The main distinction of the Swift Parrot is the long red tail that is not found in Lorikeets, which generally have dumpier green tails. During winter the Swift Parrot inhabits mainland Australia from Adelaide (S.A.) through Victoria, and up the east coast to south-east Queensland, as well as visiting the south and central western slopes and the Riverina in NSW. The Swift Parrot returns to eastern Tasmania in spring to breed.

The species appears to have declined greatly in the northern and eastern parts of its overwintering range to the extent that the NSW Scientific Committee has upgraded the listing of the Swift Parrot from Schedule 2 (Vulnerable) to Schedule 1 (Endangered) (NSW Scientific Committee, 2000). The Swift Parrot is also listed under the Commonwealth Environment Protection and Biodiversity Act (1999) as 'Endangered'. Recent investigations have indicated that there may only be 1000 breeding pairs throughout its entire range (Garnett and Crowley, 2000; Brereton, 1998; Forshaw, 1993). The continued loss of foraging resources, in particular winter-flowering Eucalypt species, appears to be most serious short term threat to this species in NSW. The most recent records are from the tablelands and western slopes of southern and central NSW. Swift Parrots have also been recorded during the winter months of 2000 utilising areas in the vicinity of Aberdare State Forest (Roderick, pers. comm.) and Millers Forest (Newman, pers. comm.).

The Swift Parrot prefers Dry Sclerophyll Forest in Tasmania and Open Forest to Woodland in the north on the mainland. It has also been recorded utilising street trees and in parks and gardens. Swift Parrots forage on the nectar of Eucalypts, often in mixed flocks with Lorikeets. The preferred winter food species are *Eucalyptus sideroxylon* (Red Ironbark), *E. albens* (White Box), *E. ovata* (Swamp Gum), *E. robusta* (Swamp Mahogany) and *E. melliodora* (Yellow Gum) and have also been observed eating the seeds and flowers of *Xanthorrhoea* spp. (Grass

Trees). They also feed on insects and their larvae, fruits, berries, seeds and vegetable matter. While feeding, individuals may be approached and watched from under the feed tree. When there is an abundance of food, large congregations of hundreds of birds may gather in noisy and crowded roosts. Nesting occurs from September to January in a hollow branch of Eucalypts and they return to the mainland during March and April.

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15. *Neophema pulchella* Turquoise Parrot

This 'grass parrot' is a striking green with brilliant blue edges to the wings, on which the male of the species also displays a bright red patch. The main distribution of the Turquoise Parrot is in grassy woodlands of the western slopes and tablelands from the Darling Downs in Queensland to northern Victoria, particularly along watercourses. It lives on the edges of Eucalypt woodland adjoining clearings and on timbered ridges and creeks in farmland. It has also been recorded utilising roadside verges and orchards. They are usually seen in pairs or small groups and spend most of the day on the ground. This species forages primarily on the seeds of shrubs, grasses and herbs, both native and introduced, and the spore cases of moss. They are approachable when feeding and have a characteristic flight call, which is described as a weak tinkling. Partly nomadic, flocks move locally and regionally following seasonal abundances of seed. Breeding pairs nest in small hollow branches of Eucalypts, usually 1m above the ground from August through December and from April to May. Two to five eggs are laid and young leave the nest after 30 days though remain with the parents. The species appears to be consolidating after a long history of decline.

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16. *Pyrrholaemus sagittatus* Speckled Warbler

The Speckled Warbler is a small bird which occurs in south-eastern Australia, from south-western Victoria through eastern New South Wales to Central Queensland, mostly on the western slopes and tablelands of the Great Dividing Range and on the driest sections of coast. Specked Warblers live in a wide range of eucalypt-dominated vegetation that have a grassy understorey, often on rocky ridges or in gullies.
Speckled Warblers feed on seed and insects. It builds a domed nest of grass, bark shreds, moss, and lined with fur on the ground. They lay 3 to 4 eggs and breeding season occurs from August to January.

Speckled Warblers have declined over most of their range. Much of the habitat has been cleared with smaller fragments gradually losing remnant sub-populations, sometimes more than 30 years after they have be isolated. Because it occurs at low densities, small patches may contain sub-populations that are vulnerable to local extinction as a result of normal fluctuations, and are unlikely to be recolonised because dispersal abilities across open land appear to be poor. Birds that occur in fragments are particularly vulnerable to nest predation. Grazing by stock, kangaroos and rabbits can remove the moderately dense groundcover the birds require.
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17. *Xanthomyza phrygia* Regent Honeyeater

The Regent Honeyeater is a medium-sized, unique Honeyeater. It is nomadic, although it does seem to return to nesting areas sporadically. Small flocks regularly, sometimes annually, visit the northern tablelands and the north western and central western slopes of NSW in the spring and summer. Individuals also appear on the NSW coast at most times of year but primarily in

winter. It occurs in temperate woodlands and open forest, including forest edges. Once commonly observed in flocks of hundreds, it is thought that the current population may not number more than 1000 individuals. Regent Honeyeaters are now seldom seen west of Bendigo, Victoria and are only occasionally observed in southern QLD.

Seasonal movements appear to be dictated by the flowering of various species of Eucalypts that are characteristic of the dry forests and woodlands of south eastern Australia. The Regent Honeyeater prefers to forage on large-flowered Eucalypts (e.g. *Eucalyptus sideroxylon*, *E. melliodora*, *E. albens, E. leucoxylon*), particularly where these trees grow in more productive areas and yield plentiful and predictable nectar flows. They also forage on mistletoe and Banksia flowers, and arthropods. In parts of coastal NSW they are also attracted to stands of *Eucalyptus robusta* (Swamp Mahogany). Recent records (winter 2000) exist of this species foraging in flowering *Corymbia maculata* (Spotted Gum) trees at Aberdare State Forest near Ellalong, NSW (Roderick, pers.comm.).

During winter, Regent Honeyeaters disperse widely in small groups. In spring they concentrate into the main breeding areas around Chiltern and Benalla in Victoria and the Capertee Valley, Bundarra District and the Warrumbungles in NSW. Other recent records suggest that the Slater, P., Slater, P., & Slater, R., 1997. *The Slater Field Guide to Australian Birds*. Lansdowne Publishing, Sydney.

species may be breeding in the vicinity of Quorrobolong, near Cessnock, NSW (Geering, pers. comm.). Nests are constructed of strips of Eucalypt bark, dried grass and other plant material. They are placed in an upright fork 4 to 25m above ground, and 2-3 eggs are laid. Nesting occurs mainly between November and January, but breeding has been recorded in all months between July and February. Radio-tracking methodologies undertaken during the summer of 2000 found that fledged birds from the Capertee Valley foraged on *Eucalyptus* sp. (Scribbly Gum) blossoms on the Newnes Plateau (Morris, pers. comm.).

The decline of the Regent Honeyeater appears to be due to a steady reduction in the extent and quality of its habitat. Many of the remaining stands of the 'key' Eucalypt species have suffered in the past from harvesting of timber and the very slow growth rates of replacement trees. Lack of regeneration due to grazing by stock and hence a lack of new trees to replace dying trees in farmland is also a serious concern.

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18. *Grantiella picta* Painted Honeyeater

This Honeyeater lives almost entirely on the berries of mistletoes, and therefore its movements are regulated by the fruiting of plants. It usually appears in south eastern Australia in September and departs in February or March. The calls of bird are loud, clear and distinctive. The nest is a small, cup shaped, lace-like structure composed of fine rootlets and fibre bound with cobweb. It is placed in the outermost drooping branches of a Eucalypt, Tea-tree or Oak, 5-20m from the ground. Although apparently very fragile (the eggs can often be seen from below) the nest is really quite strong. Breeding season is October to February with two or rarely three eggs being laid.

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19. *Climacteris picumnus victoriae* Brown Tree-creeper

The Brown Treecreeper, *Climacteris picumnus* is distributed along the east coast of Australia from Spencer Gulf in South Australia, north to Townsville in Queensland and west to Channel Country. The eastern subspecies, *Climacteris picumnus victoriae,* is distributed through central NSW on the western side of the Great Dividing range and sparsely scattered to the east of the divide in drier areas such as the Cumberland Plain of Western Sydney, and in parts of the Hunter, Clarence, Richmond and Snowy River Valleys.

This species is a medium sized insectivorous bird that occupies Eucalypt woodlands, particularly open woodlands lacking a dense understorey, River Red Gums on watercourses and around lake shores. It is sedentary and nests in tree hollows within permanent territories. They forage on tree trunks and on the ground amongst leaf litter and on fallen logs for ants, beetles and larvae. Breeding occurs from May to December.

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20. *Melithreptus gularis gularis* Black-chinned Honeyeater

Within its eastern range, the Black-chinned Honeyeater is found predominantly west of the Great Dividing Range in a narrow belt through from southern Queensland, through N.S.W. and south into Victoria and South Australia. In N.S.W., this species is mainly found in drier sclerophyll forests and woodlands containing box-ironbark associations and River Red Gum. Black-chinned Honeyeaters are also known from the drier coastal woodlands of the Cumberland Plain, Western Sydney and in the Hunter, Richmond and Clarence Valleys.

This species builds compact, cup shaped nests and feeds on arthropods and their larvae, nectar and lerp from Eucalypt foliage and bark. Breeding occurs from July to December.

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21. *Pomatostomus temporalis temporalis* Grey-crowned Babbler

The Grey-crowned Babbler ranges through open forest, woodland, scrubland, farmland and outer suburbs formerly ranging form SA to northern QLD. The species occur in NSW on the western slopes and plains, with isolated populations in coastal woodlands on the North Coast, Hunter Valley and South Coast near Nowra. Members of the species are rare in settled areas and are threatened by vegetation clearance, habitat fragmentation and degradation, and competition from introduced species. Grey-crowned Babblers inhabit Eucalypt woodlands with regenerating trees, tall shrubs, and an intact ground cover of grass and forbs. The species builds dome-shaped nests with a spout-like entrance, lined with grass, bark-fibre, rootlets, feathers, and wool. The Grey-crowned Babbler breeds between June to October in sedentary family units of 2-13 birds. The species produces 2-6 buff to purple-brown, dark grey eggs with dark brown scribbles. The species is insectivorous and forage in leaf litter and on the bark of trees.

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22. *Lophoictinia isura* Square-tailed Kite

This raptor is endemic to Australia and is widespread throughout the mainland (absent from Tasmania). It is recorded mainly in coastal and subcoastal regions, although it has been observed inland. The species is migratory throughout its range and is a spring-summer breeding migrant to south-eastern, southern and south-western Australia. The Square-tailed Kite inhabits Open Forests and Woodlands, particularly those on fertile soils with abundant passerines. They may also range into nearby open habitats but not into extensive treeless regions. This species is notably absent from alpine regions and small isolated remnant Woodland in large open areas. Within N.S.W. the species has been recorded in ridge and gully forests dominated by *Eucalyptus longifolia* (Woollybutt), *E. elata* (River Peppermint), *E. smithii* (Blackbutt Peppermint) and *Corymbia maculata* (Spotted Gum), as well as in forests of *Angophora* and *Callitris* with a shrubby understorey.

The Square-tailed Kite hunts mostly Passerines and foliage insects, though it also known to take mammals and lizards. Most prey is taken from the canopy and rarely from shrubs or in the air. Breeding occurs from July to February with an average clutch size of 3 eggs. Nests are built as a platform or bowl of sticks lined with green *Eucalyptus* leaves in forks or large horizontal branches of Eucalypts, *Angophora* or *Melaleuca* trees and may be used in successive years.

Except when breeding *Lophoictinia isura* tends to be a solitary bird, usually seen hunting alone high in, or just above the tree canopy in Coastal or Sub-coastal Rainforest, Sclerophyll Forests or Woodland. Nests have been reported in *Eucalyptus* spp., *Angophora* spp. and native pine forests. Prey taken has included fledging birds, insects, rabbits and lizards.

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23. *Ninox connivens* Barking Owl

The Barking Owl is found in forest and woodland, encountered most commonly in savanna and paperbark woodlands. It sometimes roosts in rainforests, but it requires the more open country for hunting and hollow Eucalypts for breeding. It is quite common in its favoured habitat, particularly in Northern Australia. These owls are usually found in pairs which occupy permanent territories, generally greater than 100 ha. Each pair has a number of sites

where they roost by day - usually in a leafy tree, close to the trunk, though not always well hidden. When three or four Barking Owls are seen roosting together, the extra birds are the young of that year. They breed August to October in large open hollows. The main call of the species is a repetitive barking 'wook wook', hence the common name. It does occasionally produce a rather loud and disturbing scream which has earnt it a second common name of the 'screaming woman bird'.

Mammals and birds are the main prey, though it also feeds on insects and other invertebrates. In Southern Australia it feeds particularly on rabbits. It also kills hares, rats, mice, occasional small bats and some marsupials, including possums. It kills birds up to the size of Magpies and Tawny Frogmouths. Any prey too big to be swallowed whole is torn up and eaten piece by piece. The rear parts of victims are sometimes found beneath roost trees.

This species is known from coastal and inland areas throughout Australia away from the deserts and arid interior.

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24. *Ninox strenua* Powerful Owl

The Powerful Owl is found in the coastal areas and adjacent ranges of eastern Australia from South Australia to around Rockhampton in Queensland, generally within 200km from the coast. Within N.S.W., Powerful Owls are distributed throughout the length of the Great Dividing Range, which is their stronghold, and extend from the coast to the western slopes where they occur in much lower numbers. The Powerful Owl inhabits a wide range of vegetation types from wet Eucalypt forests with a Rainforest understorey to Dry Open Forests and Woodlands. The species has been recorded utilising disturbed habitats such as exotic pine plantations and large trees in parks and gardens. A resident pair of Powerful Owls has been recorded in recent years from Blackbutt Reserve, near Newcastle, N.S.W. It appears that this pair successfully reared two young during the 2001 breeding season (HBOC, pers. comm.).

The Powerful Owl is the largest predator of nocturnal forest-dwelling animals in Australian forests. Major prey species in NSW forests are the Greater Glider, Common Ringtail Possum, Sugar Glider, Grey-headed Flying Fox, and several species of diurnal birds, including the Pied

Currawong, Magpie and Lorikeets. It rests during the day amid thick foliage, often grasping food-remains. The male of the species employs a slow, far-carrying 'whoo-hoo' call, more deliberate than the female call, which is higher pitched with the second note slightly higher than the first.
Powerful Owls nest in a slight depression in the wood-mould on the base of a cavity in a large old tree, sometimes in excess of 25 metres above the ground. These trees are usually found growing on a hillside in heavy forest and may be utilised intermittently for several years. The breeding season of the Powerful Owl is highly synchronised, being strictly winter breeders. One or two young are produced, although some pairs do not breed in every year. Pairs appear to mate for life and occupy exclusive territories that can be greater than 800ha in size (Kavanagh, 2000).

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25. *Tyto novaehollandiae* Masked Owl

Masked Owls in NSW are distributed throughout the length of the Great Dividing Range and extend from the coast to the western slopes. Within this range they inhabit a range of wooded

habitats that contain both mature trees for roosting and nesting and more open areas for hunting. They are most commonly encountered within Open Forest with a sparse understorey as well as along the ecotones of these areas to more or less densely vegetated habitats. There is much evidence to suggest, however, that the species is not entirely restricted to forested habitats and will readily hunt along the ecotone between wooded habitats and a range of open habitats such as pastoral land (Marchant, 1999 and references cited therein). Their diet comprises mainly ground-dwelling prey, including several species of native and introduced Rodents, *Antechinus* spp. and Bandicoots. On occasions, other prey such as Possums, Gliders and other birds are taken. Strictly nocturnal, Masked Owls will perch for long periods, up to several hours, in an exposed area, waiting to ambush a passing prey animal.

Masked Owls are recognised as being the least common of the three large forest Owls in NSW (Kavanagh and Murray, 1996). Evidence suggests that the species may be secure eastwards of the Great Divide in forests that are not intensively logged, although it may be threatened in cleared and overgrazed areas westwards of the range (Debus and Rose, 1994). The paucity of records of Masked Owls in NSW appears unusual due to the species dietary flexibility and its ability to utilise disturbed habitats (Kavanagh, 1996). This may be due to the apparent reluctance to vocalise during non-breeding periods, making the species difficult to detect for most of the year.

Masked Owls usually roost in large hollows inside large, old living trees, most often Eucalypts. Within dry forests they often choose hollow trees in gullies or drainage lines. These hollows are 1 to 5 metres deep, 40 to 50 cm wide. The trees containing these hollows are likely to be quite old (>150 years). They are also known to roost among the dense foliage of other trees such as *Pandanus, Livistona, Melaleuca* and *Acacia* species. There are also records of Masked Owls roosting in introduced pine trees and in shrubs in gardens and suburban areas (Marchant, 1999and references cited therein). The species also nests in large hollows, although there appears to be a preference for hollow tree trunks and vertical spouts of large trees. The breeding season, like that for other *Tyto* owls, is variable but there is a tendency for breeding to occur in autumn-winter. Two or three young are produced, although some pairs do not every year. Pairs appear to mate for life and occupy exclusive territories in order of 1000ha in size. A radio-tracked bird near Newcastle was found to utilise a home-range of between 1017-1178ha (Kavanagh and Murray, 1996) and another documented pair of Masked Owls in the North Lake Macquarie area may possibly be utilising a home range of up to 1700 hectares (Young, 1998).

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26. *Petrogale penicillata* Brush-tailed Rock-wallaby

The Brush-tailed Rock-wallaby is an agile inhabitant of rocky slopes of south-eastern Queensland and northern New South Wales with remnant populations in Victoria and western New South Wales. The sites occupied by *P. penicillata* mostly have a northerly aspect, so as to allow the animals to sun themselves in the early morning and late afternoon. They rest by day in rock crevices and emerge in the late afternoon to forage for grasses, leaves, flowers and seeds.

Breeding occurs throughout the year. The female has a forward opening pouch with four teats, though it usually rears only one young at a time.

P. penicillata is identified by its distinct colouring of brown above with chest and belly paler, white to buff cheek stripe and a black dorsal stripe from forehead to back of head. Feet and paws are dark brown to black and the tail darkens distally with a prominent brush.

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27. *Phascogale tapoatafa* Brush-tailed Phascogale

A nocturnal species, the Brush-tailed Phascogale is mainly arboreal but also forages on the ground, eating insects and occasionally small vertebrates. The Brush-tailed Phascogale is known from a variety of forest types from Rainforest to Woodland, but is most frequently recorded in the drier Sclerophyll Forests with little ground cover, on ridges up to 600m altitude. There are two subspecies of the Brush-tailed Phascogale, the nominate race, *P. t. tapoatafa,* which occurs in south-east NSW, Victoria and south-east SA and *P. t. pirata,* which occurs in northern Australia.

It requires small tree hollows and suitable foraging sites in the canopy, sub-canopy, and ground layer of vegetation. During the day it sleeps in a nest lined with leaves or shredded bark in a tree hollow, emerging at dusk to feed. Animals may return to the nest occasionally through the night and, when several share a nest, they tend to show a similar pattern of nocturnal activity. Home ranges vary from between 20-70ha for females, and there is often no overlap in this home range with other unrelated females of the species. Males may occupy an area of greater than 100ha and contrary to females, overlap with the home ranges of other males and females. Females may only occupy a home range of 4-5ha when carrying young. It is sexually mature at 11 months, with mating in June. The female has 8 teats and young are weaned at around 5 months of age. Males die soon after mating while females may breed over two consecutive years.

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28. *Dasyurus maculatus maculatus* Tiger Quoll

The Tiger Quoll is widespread in eastern Australia, with its distribution being spread between two subspecies. The nominate subspecies, *D. m. maculatus* occurs from southern QLD to Tasmania whereas *D. m. gracilus* occurs in northern QLD. This species is one of the largest carnivorous marsupials. It is an agile climber but spends most of its time on the floor of sclerophyll forests, rainforests and coastal woodlands. Although largely nocturnal, it may forage and bask in the sun during the day. Nests are made in rock caves and hollow logs or trees, and basking sites are usually found nearby. It is an opportunistic hunter of a variety of prey, including birds and their young, rats and other small terrestrial and arboreal mammals, gliders, small Macropods, reptiles and Arthropods. It also scavenges on the carcasses of domestic stock. Sexual maturity is attained in one year, with mating occurring from April to July. Usually, there are 5 young to a litter and young are fully independent at 18 weeks.

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29. *Phascolarctos cinereus* Koala

The Koala occurs along the east coast of Australia and extends into woodland, mulga and River Red Gum forests west of the Great Dividing Range. Its range covers all such suitable areas of N.S.W. In drier forested areas, Koalas are generally observed as individuals in low densities. They are more abundant in coastal woodland and in open forest, where they have been found in densities as high as ten per hectare. They are rare or absent in wet forests in the south above 600 m which may be due more to distribution of Eucalypt species than climate, as the Koala is limited to areas where there are acceptable food trees. Its diet is generally restricted to that of Eucalypt leaves and much less-often, non-Eucalypt foliage. The foliage of *Eucalyptus camaldulensis* (River Red Gum), *E. tereticornis* (Forest Red Gum), *E. punctata* (Grey Gum), *E. viminalis* (Manna Gum), and *E. robusta* (Swamp Mahogany) are some of the preferred Eucalypt species. Koalas use a wide variety of tree sizes, and do not preferentially use large or tall trees in NSW forests, although this has been listed as a habitat preference in areas where trees are generally small, stunted, or nutrient deprived.

Koalas sleep in the fork of a tree during the day and feed at night with the peak of activity just after sunset. It is generally a solitary animal with a social behaviour pattern that influences its breeding biology. Breeding biology of the Koala is characterised by the occurrence of discrete core breeding groups which are sedentary. A core group may comprise up to several dozen individuals that are usually well separated from other breeding groups. These core groups produce a continual supply of dispersing nomadic sub-adults. Individual Koalas within core breeding groups occupy semi-exclusive territories. There is interaction with and marginal overlap of territories between adjacent individual animals. The territories of breeding males generally occur within a matrix of adjacent territories of breeding females. In the overlap zones of adjacent territories of breeding Koalas, individual trees occur that are habitually used for interaction between the two animals concerned. These breeding core interaction trees (sometimes termed "home range trees") are readily identifiable by scratched "trails" up the bole and copious dung deposits at the base of the tree. Breeding occurs in summer and young females produce one young (rarely twins) each year.

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30. *Petaurus norfolcensis* Squirrel Glider

The Squirrel Glider is distributed throughout the dry sclerophyll forests and woodlands of eastern Australia from South Australia to Cairns. In Victoria its range was considered to be narrow where it inhabited remnant woodlands and open forests which have mature or mixed-age stands of more than one Eucalypt species, or riparian forests of *Eucalyptus camaldulensis* (River Red Gum). In NSW, the Squirrel Gliders' range has recently been extended to coastal habitats, including Swamp Mahogany Swamp forests on the Central Coast. In Victoria the Squirrel Glider occurs predominantly in dry woodland west of the Great Dividing Range. The full range of habitats in which it is found in NSW have not been fully reported in any literature.

The Squirrel Glider eats a high proportion of invertebrates from the foliage of Eucalypts and *Acacias* supplemented by plant exudates in the form of Eucalypt and *Melaleuca* sap and *Acacia* gum. Insects (Coleoptera) and caterpillars (larval Lepidoptera) were found to be very important in its diet. The plant exudates, honeydew, pollen and nectar were considered to be more important in winter and spring. It is also likely that birds eggs are included in its diet. It is thought that a mixed stand of gum and high nectar producing Eucalypts, (including some which flower in winter) were important to support the Squirrel Glider. In coastal NSW forests a significant component may be mature *Acacia irrorata*, *Melaleuca styphelioides* or *M. nodosa*, providing late winter/early spring carbohydrates.

The breeding biology of the Squirrel Glider is probably similar to that of the Sugar Glider. It nests in a leaf-lined hollow in a tree or stump. Interbreeding between the Squirrel Glider and the Sugar Glider has been evidenced in captivity (Fleay, 1947), and is strongly suspected in the wild. Resultant offspring are noted as having intermediate characteristics between those of the two parent animals.

It has been reported that Squirrel Gliders are consistently preyed upon by cats and foxes and it has been believed that an increase in this predation may result from the opening up of bushland through rural-residential or other development. While this increased predation may adversely impact upon populations of this species it may not be the only impact causing the extinction of populations in developed areas. However, in the absence of detailed studies, it is believed that provided domestic cats are excluded, a rural-residential subdivision with a minimal amount of clearing and retention of adequate habitat connections may not have a significantly deleterious effect upon a population of these gliders.

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31. *Pseudomys oralis* Hastings River Mouse

This species is only been known to occur at 21 localities within a narrow and discontinuous band of moist forest along the Great Dividing Range, north from Singleton to Warwick, S.E. Queensland (NPWS, 1999). The Hastings River Mouse is a small rodent with a body length of approximately 170mm. Distinguished by the brownish-grey fur above, buff to greyish-white below and white feet. The tail is furred white on the under side. The snout is strongly rounded and the eyes are large and bulging with a black eye-ring.

This species lives in a variety of dry open forest and woodland types with dense low ground cover. Ideal ground cover ranges from 10 to 75cm and may consist of grass, sedge, rush or heath (NPWS, 1999). Permanent shelter such as rocky outcrops, are important, as is access to seepage zones, creeks and gullies. Diet consists of seeds, leaves, insects and fungi. Breeds between August and March, producing two to three young.

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32. *Pteropus poliocephalus* Grey-headed Flying-fox

The Grey-headed Flying-fox is distributed predominantly along the sub-tropical east coast, from Rockhampton (Qld) through NSW to SE Victoria. It is a fairly large species, weighing up to a kilogram and having a forearm length of up to 180mm. It is the only Australian Flying-fox to possess a mantle of rusty brown fur that full encircles the neck. The fur on the back is dark grey and as the common name suggests, the head is covered with light grey fur. The grey belly fur is often flecked with white and ginger. The fur extends down the legs to the toes., which contrasts with other *Pteropus* species, which are furred only to the knees.

Grey-headed Flying-foxes are known to occupy a variety of habitats, including wet and dry sclerophyll forests, rainforest, mangroves and paperbark swamps and *Banksia* woodlands. Here they forage on a range of fruits and blossoms. Their diet is so varied that they have been recorded eating the fruit or blossom of more than 80 species of plant. The predominant food source is Eucalypt blossom and fruits from trees such as *Ficus* spp. (Figs). It is likely to act as an important pollinator for many of the trees on which they utilise blossoms. They also inhabit cultivated areas where they feed on introduced trees including commercial food crops, and can become a 'pest' animal in these areas. Ironically, this has led to this species being the most intensively researched bat in Australia.

As with most species of Flying-fox, *P. poliocephalus* roost communally where they form large communal colonies called 'camps'. Camps are mostly in rainforest patches, mangroves, paperbark forests and modified vegetation in urban areas. These camps may contain thousands of individuals, and up to 200 000 individuals have been recorded at one camp. They may move up to 70km from the camp each night to forage. Young are raised in maternity camps after birthing in September to October. The young are able to fly at 3 months of age and puberty is reached at 18 months, although males do not achieve effective fertility until 30 months. Vocal communication is highly sophisticated, with over 20 different situation-specific calls being recorded.

The key threats to Grey-headed Flying-fox include the clearing or modification of native vegetation, in particular roost-camp habitat as well as winter food resources in NE NSW. This species is also threatened by persecution in the form of shooting of animals and the destruction of roost camps. This oppression may be a result of Grey-headed Flying-foxes being a perceived pest in agricultural areas or as presenting a noise problem in more urbanised areas. Recently, it has been identified as being a potential carrier of viral pathogens, such as Lyssa-virus. Another threat is from competition and hybridisation with *P. alecto* (Black Flying-fox).

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33. *Chalinolobus dwyeri* Large-eared Pied Bat

This species was only identified in the late 1960's and as such very little is known about it's distribution or habitat tolerances. The Large Pied Bat ranges from Rockhampton in central Queensland to Bungonia in southern NSW. This species has been found occupying dry sclerophyll forest and woodland, both to the east and west of the Great Divide. Recordings of this species have also been made in subalpine woodland and at the ecotone of rainforest and wet Eucalypt forest.

The Large-eared Pied Bat roosts in caves, abandoned mud-nests of Fairy Martins and mine tunnels. Colonies recorded have ranged in size from 3 to 37 individuals, and are usually located in the twilight area not far from the cave entrance. The physiology of the bat suggests that it feeds primarily on small insects below the canopy. They fly relatively slowly with rapid but shallow wing beats. During autumn and early winter the males have enlarged testes. At this time, the facial glands on either side of the muzzle become swollen and show a cream colour beneath the skin. They exude a milky secretion when compressed. It is probable that these glands have a secondary sexual function. It is not known whether mating occurs in the autumn or spring; hence the duration of pregnancy is also unknown. The females give birth in November, commonly to twins, and the young are independent by late February. They leave the cave soon after and the females remain another month before abandoning the roost in late March for the winter. It is thought that during the cooler winter months the colony disperses for individual hibernation.

34. *Falsistrellus tasmaniensis* Eastern Falsistrelle

The Eastern Falsistrelle occurs along the coastal ranges from southern Queensland to western Victoria, and is endemic to Australia. These bats inhabit sclerophyll forests from the Great Divide to the east coast. In Tasmania they are found in wet sclerophyll and coastal mallee. A preference has been noted for wet habitats where trees are more than 20m high. Based upon

the size and shape of its wings the bat it thought to be highly mobile with a relatively large hunting range. A specimen of this species has been radio-tracked and found to move 12km from where it was hunting to where it was roosting in a very large tree.

On the mainland they eat moths, rove beetles, chafers, weevils, plant bugs, flies and ants. Their flight is swift and direct, within or just below the tree canopy. They tend to fly fast in a fixed horizontal plane with sudden darting changes in course. It has been observed roosting in holes and hollow trunks of Eucalypts, with recorded colony sizes ranging from 3 to 36 individuals. Colonies are usually almost entirely male or female groups, although evenly mixed colonies sometimes occur. They have been recorded roosting in a cave at Jenolan, NSW, and they are occasionally found in old wooden buildings.

Males produce sperm in late summer and store it in the epididymis over the winter. Females produce a large 'hibernation follicle' in autumn. Ovulation, fertilisation and pregnancy occur in late spring and early summer. Single young is born in December. Lactation continues through January and February. The Eastern Falsistrelle hibernates generally during winter, particularly in the southern extent of its range.

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35. *Miniopterus australis* Little Bentwing-bat

This species inhabits tropical rainforest to warm-temperate wet and dry sclerophyll forest occurring along the coastal plains and adjacent ranges from Cape York to north-eastern NSW around the Hunter River. Its distribution within Australia becomes increasingly coastal towards the southern limit of its range in NSW.

It is a sub-canopy hunter with a preference for well-timbered areas but it is also known to hunt in clearings adjacent to forests. Prey items include crane flies, ants, moths and wasps. Flight characteristics include rapid movement with considerable manoeuvrability.

The species is a cave dweller that congregates in the summer months in maternity roost colonies and disperses during winter. In the southern part of their range they hibernate during winter but in the north they remain active throughout the year. Recorded roosts include caves, mines, stormwater drains, disused railway tunnels and houses. Mating, fertilisation and implantation occur in July to August, followed by a period of retarded embryonic development until mid-September. Pregnant females congregate in specified large nursery caves to rear their young. Births occur in December, when single young are born. It is often found to roost with the Large Bentwing-bat (*Miniopterus schreibersii*), and benefits from this larger species' ability to increase the roost temperature using metabolic heat. There is a huge nursery colony of 100,000 adult bats at Mt. Etna caves, in central Queensland.

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36. *Miniopterus schreibersii oceanensis* Large Bentwing-bat

The Large (or 'Common') Bentwing-bat may occur throughout the world. However, Parnaby (1992) notes that the Australasian populations are unlikely to be the same species that occurs outside this area. Within Australia, it is found across the coastal and near coastal areas of the north of the NT and WA and also down the east coast from Cape York to Adelaide on the coastal plains and adjacent ranges.

It is a cave (and similar man-made structures) roosting species that generally feeds above the forest canopy in wet and dry tall open forest, catching insects on the wing. However, the species has also been recorded utilising rainforest, monsoon forest, open woodland, paperbark forests and open grasslands. Moths are the main prey item. Flight is very fast and typically relatively level with swift shallow dives; the estimated flight speed is 50km per hour.

The species is known to migrate over large distances, apparently utilising different roosts for different seasonal needs. The pattern of movement varies with local climate and the dispersion of suitable roost sites. It hibernates over winter in the southern parts of its range and development of the embryo may be delayed over winter by lowering body temperature using roosts in the cooler areas of a cave. Pregnant females roost in large colonies in nursery caves. Birth generally occurs around December. Females cluster together in a roost that generally possesses a domed roof, which allows for the retention of warm air which may also promote faster growth. The young can fly by 7 weeks and reach adult size and are weaned by 10 weeks. The mothers then leave the cave to disperse to their winter roosts and a few weeks later, usually in March, there is a mass exodus of juveniles. The maternity colony is deserted by April.

The longevity record for an Australian bat is from a pregnant female Large Bentwing-bat that was banded and recaptured 18 years later (she was again pregnant).

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37. *Mormopterus norfolkensis* East Coast Freetail-bat

This species is distributed along the east coast of New South Wales from south of Sydney extending north into south-eastern Queensland, near Brisbane. There are no records west of the Great Dividing Range. This species appears to live in Sclerophyll Forests and Woodland. Usually only solitary bats are captured, but one group was caught flying low over a rocky river in Rainforest and Wet Sclerophyll Forest. When hunting insects it flies swiftly above

the forest canopy or in clearings at the edge of the forest. Their diet is largely unknown. Small colonies have been found in tree hollows or under loose bark and specimens have been collected from under house roofs and the metal caps on telegraph poles. It commonly roosts with other species of bats, including *Scotorepens orion* (Eastern Broad-nosed Bat) and *Chalinolobus gouldii* (Gould's Wattled Bat).

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38. *Myotis adversus* Large-footed Myotis

The Large-footed Myotis has been recorded along much of the coastal strip of Australia occurring from the east of South Australia, around the Victorian, New South Wales, Queensland and Northern Territory coasts and into Western Australia as far as the Kimberleys (the northern population is likely to be a different subspecies - currently undergoing taxonomic revision).

In N.S.W., the Large-footed Myotis is found in various habitats of the coast and adjacent ranges. Recently, it has also been found along the Murray River valley well into South Australia. It is a small bat that hunts by raking the surface of the water for aquatic insects and small fish, it seldom occurs far from suitable water bodies which range from rainforest streams to large reservoirs and even brackish water. Some aerial hunting also occurs. Prey items include moths, beetles, crickets, cockroaches, flies and many water insects.

It roosts in small colonies of between 15 and several hundred individuals with recorded roosts including caves, mines and disused railway tunnels as well as dense rainforest foliage in the tropical parts of its range. Some occurrences of roosting in tree hollows are also noted. Males establish territories within the colony and monopolise a cluster of females during the breeding season. Outside the breeding season, males roost separately. The number of pregnancies per year varies with latitude. In N.S.W. and Victoria there is one pregnancy per year, the single young being born in November to December. In southern Queensland they produce two litters of single young in October and January. Males show two peaks of testicular development: in April to June and in September to November. Lactation lasts for about eight weeks and young born in late September suckle until late December. The bond between mother and young extends a further 3 to 4 weeks after weaning; they hunt together and roost together during this period. In northern Queensland they are reported to have three births per year.

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39. *Scoteanax rueppellii* Greater Broad-nosed Bat

The Greater Broad-nosed Bat occurs only along the eastern coastal strip of Queensland and NSW where it is restricted to the coast and adjacent areas of the Great Dividing Range. In NSW it extends as far south as the Bega Plain. They are only found at low altitudes (below 500m).

This species apparently feeds on large moths and beetles, and some small vertebrates, emerging just after sundown, flying slowly and directly at a height of 3-6 metres, deviating only slightly to catch larger insects. It is also predatory on vertebrates including other bats, and is a noted carnivore on other captured bats in bat traps. *S. rueppellii* is known to hunt along tree-lined creeks, the junction of woodland and cleared paddocks, and low along rainforest creeks. It may have a preference for wet gullies in tall timber country.

The species roosts mainly in tree hollows but it has also been found in the roof spaces of old buildings. Little is known of the reproductive cycle, but it is suggested that the species follows the typical vespertilionid pattern. What is known is that females congregate in maternity colonies and single young are born in January, slightly later than the other Vespertilionid bats that share its range. Males appear to be excluded from the colony during the birthing and rearing of the young.

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40. *Vespadelus troughtoni* Eastern Cave Bat

This species remains one of the least known members of its genus in Eastern Australia. It is a cave-dweller, known from wet sclerophyll forest and tropical woodlands from the coast and Dividing Range to the drier forests of the semi-arid zone. It has been found roosting in small groups in sandstone overhangs, in mine tunnels and occasionally in buildings. In all situations, the roost sites are frequently in reasonably well-lit areas. Single-sex colonies varying in size from 6 to 50 individuals are more commonly recorded; however a large colony of 500 individuals of equal sex ratio has been recorded in a mine. These bats were huddled together and only occupied one-third of a square metre of ceiling.

Although it is widely distributed, relatively few records of this species exist, particularly in the southern part of its range where it appears to be localised. The main population stretches from Cape York south to the mid-north coast of NSW. Little is known of its diet and hunting behaviour. Similarly, information on reproductive activities is limited to the noted capture of lactating females in December in the Atherton Tablelands.

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APPENDIX B:
FLORA LIST FOR THE STUDY AREA

FLORA SPECIES LIST

The following list includes all species of vascular plants observed on site during fieldwork. It should be noted that such a list cannot be considered comprehensive, but rather indicative of the flora. It can take many years of flora surveys to record all of the plant species occurring within any area, especially plant species that are only apparent in some seasons such as orchids.

A number of species cannot always be accurately identified during a brief survey, generally due to a lack of suitable flowering and/or fruiting material. Any such species are identified as accurately as possible, and are indicated in the list thus:

* Specimens which could only be identified to genus level are indicated by the generic name followed by the abbreviation "sp.", indicating an unidentified species of that genus;

* Specimens for which identification of the genus was uncertain are indicated by a question mark ("?") placed in front of the generic, which is followed by the abbreviation "sp.";

* Specimens which could be accurately identified to genus level , but could be identified to species level with only a degree of certainty are indicated by a ("?") placed in front of the epithet.

Authorities for the scientific names are not provided in the list. These follow Harden (1991, 1992, 1993 and 2000). Names of families and higher taxa follow a modified Cronquist System (1981).

Introduced species are indicated by an asterisk ("*").

The following standard abbreviations are used to indicate subspecific taxa:

ssp. - subspecies
var.- variety
× - hybrid between the two indicated species

FLORA LIST FOR THE SITE

SCIENTIFIC NAME	COMMON NAME
CLASS FILICOPSIDA (Ferns)	
Azollaceae	
Azolla filiculoides	Pacific Azolla
Marsileaceae	
Marsilea sp.	Nardoo
Schizaeaceae	
Cheilanthes sieberi ssp. *sieberi*	Mulga Fern
MAGNOLIOPSIDA: Magnoliidae LILOPSIDA: (Monocotyledons)	
Anthericaceae	
Laxmannia gracilis	Slender Wire Lily
Commelinaceae	
Commelina cyanea	
Murdannia graminea	Blue Murdannia
Cyperaceae	
Cyperus eragrostis	Umbrella Sedge
Elaeocharis sp.	
Fimbristylis dichotoma	
Gahnia aspera	Rough Saw-sedge
Lepidosperma laterale	
Iridaceae	
**Romulea* rosea var. *australis*	Onion Grass
Juncaceae	
**Juncus acutus*	Spike Rush
**Juncus cognatus*	
Juncus usitatus	Common Rush
Philydraceae	
Philydrum lanuginosum	Woolly Frogmouth
Phormiaceae	
Dianella caerulea var. *caerulea*	Blue Flax-lily
Dianella revoluta	Blue Flax-lily
Poaceae	
Agrostis avenacea	Blown Grass
Aristida ramosa var. *ramosa*	Three-awn Speargrass
Aristida vagans	Three-awn Speargrass
Austrodanthonia sp.	Wallaby Grass
**Briza maxima*	Quaking Grass
**Briza minor*	Shivery Grass
**Bromus catharticus*	Prairie Grass
Cynodon dactylon	Common Couch
Cymbopogon refractus	Barbed Wire Grass
Dichelachne micrantha	Plume Grass
Digitaria parviflora	Smallflower Fingergrass
Echinopogon caespitosus var. *caespitosus*	Hedgehog Grass
Entolasia stricta	

SCIENTIFIC NAME	COMMON NAME
Eragrostis brownii	Browns Love Grass
Imperata cylindrica var. *major*	Blady Grass
Microlaena stipoides var. *stipoides*	Weeping Meadow Grass
**Paspalum dilatatum*	Paspalum
Poa labillardieri	Tussock Grass
Sporobolus creber	Slender Rats Tail
Themeda australis	Kangaroo Grass
Typhaceae	
Typha orientalis	Cumbungi
Xanthorrhoeaceae	
Lomandra multiflora ssp. *multiflora*	
MAGNOLIIDAE (Dicotyledons)	
Amaranthaceae	
Alternanthera nana	
Asclepiadaceae	
**Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush
Asteraceae	
Cassinia arcuata	Chinese Scrub
**Cirsium vulgare*	Spear Thistle
**Conyza bonariensis*	Flax-leaved Fleabane
Chrysocephalum apiculatum	Yellow Buttons
Epaltes australis	
**Hypochaeris radicata*	Catsear
Ozothamnus diosmifolium	Everlasting
**Senecio madagascariensis*	Fireweed
**Sonchus oleraceus*	Common Sow Thistle
Boraginaceae	
**Echium plantagineum*	Paterson's Curse
Brassicaceae	
**Lepidium bonariense*	
Cactaceae	
**Opuntia stricta*	Prickly Pear
Campanulaceae	
Wahlenbergia gracillis	Native Bluebell
Caryophyllaceae	
**Cerastium glomeratum*	Mouse Ear Chickweed
Casuarinaceae	
Casuarina glauca	Swamp She-oak
Chenopodiaceae	
Einadia nutans	Nodding Salt Bush
Convolvulaceae	
Dichondra repens	Kidney Weed

SCIENTIFIC NAME	COMMON NAME
Crassulaceae	
Crassula sieberana	Australian Stonecrop
Epacridaceae	
Leucopogon juniperinus	Prickly Beard-heath
Lissanthe strigosa	Native Cranberry
Melichrus urceolatus	
Fabaceae (Faboideae)	
Chorizema parviflorum	Eastern Flame Pea
Daviesia ulicifolia	-
Glycine clandestina	Love Creeper
Glycine tabacina	Love Creeper
Jacksonia scoparia	Dogwood
**Trifolium campestre*	Hop Clover
**Trifolium repens*	White Clover
Gentianaceae	
**Centaurium erythraea*	Common Centuary
Goodeniaceae	
Goodenia rotundifolia	Star Goodenia
Haloragaceae	
**Myriophyllum aquaticum*	Milfoil
Lobeliaceae	
Pratia purpurascens	White Root
Loranthaceae	
Dendrophthoe vitellina	
Malvaceae	
**Sida rhombifolia*	Paddy's Lucerne
Mimosoideae	
Acacia falcata	
Acacia elongata	
Myrtaceae	
Angophora floribunda	Rough-barked Apple
Corymbia maculata	Spotted Gum
Eucalyptus crebra	Narrow-leaved Ironbark
Eucalyptus fibrosa ssp. *fibrosa*	Broad-leaved Ironbark
Eucalyptus tereticornis	Forest Red Gum
Melaleuca decora	White Feather Honeymyrtle
Melaleuca thymifolia	Thyme-leaved Paperbark
Oleaceae	
**Olea europaea* ssp. *cuspidata*	Common Olive
Oxalidaceae	
Oxalis corniculata	Creeping Oxalis
Oxalis perennans	-
Pittosporaceae	
Bursaria spinosa ssp. *spinosa*	Blackthorn

SCIENTIFIC NAME	COMMON NAME
Polygonaceae	
Rumex brownii	Swamp Dock
Proteaceae	
Hakea sericea	Needlebush
***Grevillea montana* ROTAP**	
Plantaginaceae	
**Plantago lanceolata*	Plantain
Rubiaceae	
Opercularia diphylla	
Pomax umbulata	Pomax
Santalaceae	
Exocarpus cupressiformis	Native Cherry
Scrophulariaceae	
Veronica plebeia	Speedwell
Solanaceae	
**Solanum nigrum*	Blackberry Nightshade
Solanum prinophyllum	Forest Nightshade
Thymelaeaceae	
Pimelea linifolia	Rice Flower
Verbenaceae	
**Verbena bonariensis*	Purple Top
**Verbena rigida* var. *rigida*	Veined Verbena

APPENDIX C

VEGETATION TRANSECT & PLOT DATA

C1.0 TRANSECT METHODOLOGY

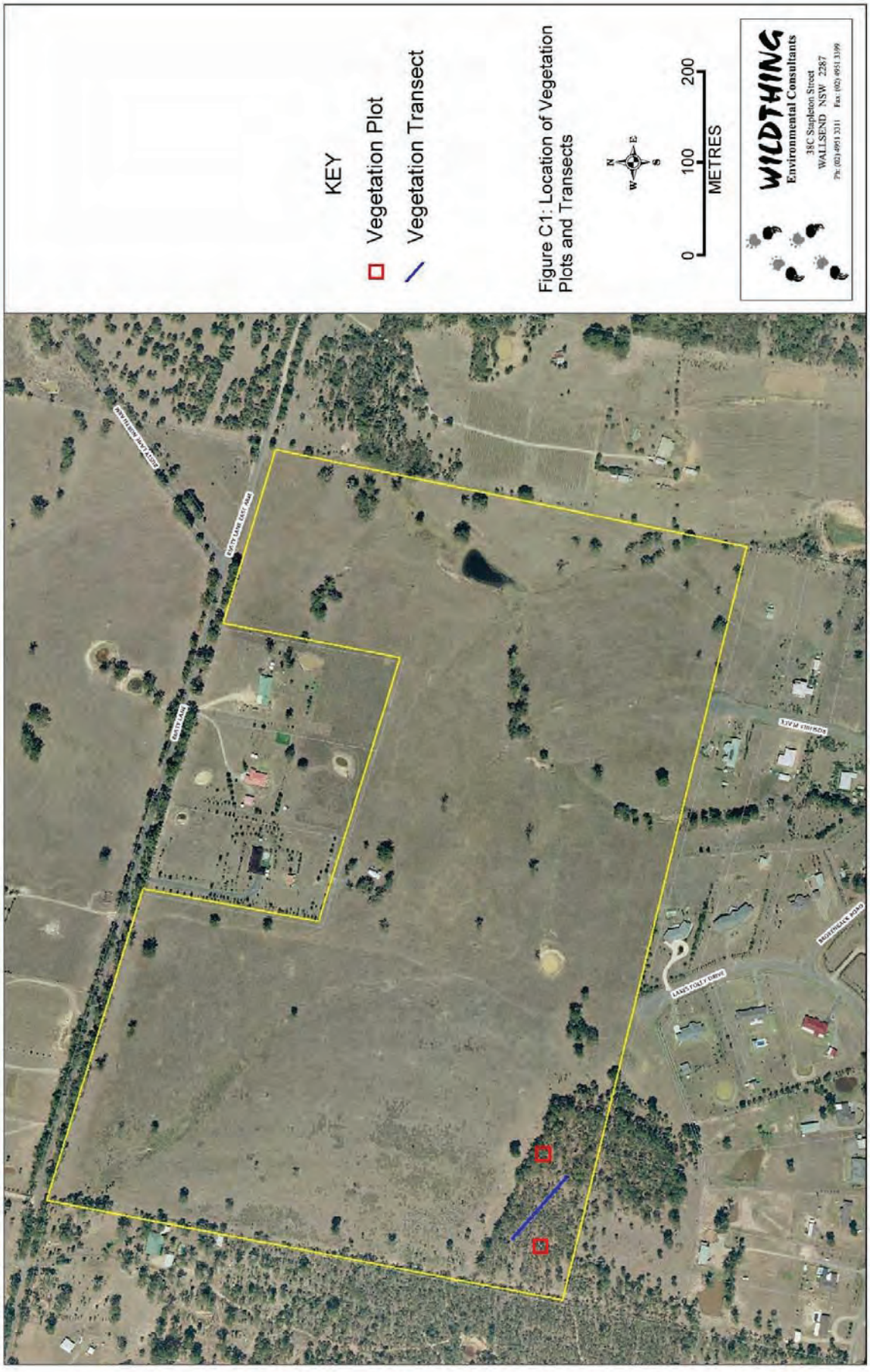
Two walking transects were undertaken within the bounds of the site to provide detail on the floral assemblages occurring therein. The location of transects are shown in Figure C1.

TRANSECT 1

*Community – Spotted Gum Ironbark Forest
*Length – 100m
*Canopy – to 15m
*Aspect – level ground
*Soil Type - Sandy

Species Recorded –

Ozothamnus diosmifolium	Everlasting
Pimelea linifolia ssp*. linifolia*	Rice Flower
Corymbia maculata	Spotted Gum
Dendrophthoe vitellina	
Grevillea montana	
Melichrus urceolatus	Jam Tarts
Eucalyptus crebra	Narrow-leaved Ironbark
Daviesia ulicifolia	
Cheilanthes sieberi ssp. *sieberi*	Mulga Fern
Chorizema parviflorum	Eastern Flame Pea
Acacia elongata	
Themeda australis	Kangaroo Grass
Lomandra multiflora ssp. *multiflora*	
Laxmannia gracilis	Slender Wire Lily
Pomax umbulata	Pomax
Entolasia stricta	
Aristida vagans	Three-awn Speargrass
Lepidosperma laterale	Swordgrass
Epaltes australis	
Chrysocephalum apiculatum	Yellow Buttons
Cassytha aculeata	
Goodenia rotundifolia	
Melaleuca decora	


KEY
Vegetation Plot
Vegetation Transect
Figure C1: Location of Vegetation Plots and Transects
N
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METRES
WILDTHING
Environmental Consultants
38C Stapleton Street
WALLSEND NSW 2287
Ph: (02) 4951 3211 Fax: (02) 4951 3199

C2.0 PLOT METHODOLOGY

Two plot-based vegetation surveys were undertaken within the bounds of the site to provide additional detail on the flora assemblages present (Figure C1). The plot was 20 × 20m in area. All species observed within the quadrat were recorded, with the dominant species in each stratum being duly noted. A modified Braun-Blanquet 6-point scale (Braun-Blanquet 1927, with selected modifications sourced from Poore 1955 and Austin *et al*. 2000) was used to estimate cover-abundances of all plant species within each plot. The cover-abundance categories are shown in Table C1.

Table C1: Modified Braun-Blanquet Crown Cover-abundance Scale

Class	Cover - Abundance	Notes
1	Few individuals (less than 5% cover)	Herbs, sedges and grasses: < 5 individuals Shrubs and small trees: 5 or more individuals
2	Many individuals (less than 5% cover)	Herbs, sedges and grasses: 5 or more individuals Medium-large over hanging tree
3	5 – < 20% cover	-
4	20 – < 50% cover	-
5	50 – < 75% cover	-
6	75 – 100% cover	-

PLOT 1

*Community – Spotted Gum Ironbark Woodland

*Date – 19/02/09
AMG Ref. E – 347827
N - 6387468
*Aspect – Westerly
*Soils - Sandy

*Structural Components –

Canopy	(to 15m)	%coverage = 35%
Mid Layer	(to 8m)	%coverage = 15%
Shrub Layer	(to 2m)	%coverage = 5%
Ground Cover	(to 1m)	%coverage = 60%

*Species Recorded –

Canopy Dominants

Corymbia maculata	Spotted Gum	2
Eucalyptus fibrosa	Broad-leaved Ironbark	1
Eucalyptus crebra	Narrow-leaved Ironbark	1

Mid Layer Dominants

Corymbia maculata	Spotted Gum	1
Eucalyptus fibrosa	Broad-leaved Ironbark	1

Shrub Layer Dominants

Acacia elongata		1

Ground Cover Dominants

Entolasia stricta

Additional Species Recorded

Themeda australis	Kangaroo Grass	2
Lomandra multiflora ssp. *multiflora*		1
Laxmannia gracilis	Slender Wire Lily	1
Pomax umbulata	Pomax	1
Jacksonia scoparia	Dogwood	1
Lepidosperma laterale	Swordgrass	1
Melaleuca thymifolia	Thyme	1
Melichrus urceolatus	Jam Tarts	1
Ozothamnus diosmifolium	Everlasting	1
Pimelea linifolia ssp. *linifolia*	Rice Flower	1
Cheilanthes sieberi ssp. *sieberi*	Mulga Fern	1
Aristida vagans	Three-awn Speargrass	1
Acacia falcata		
Xanthorrhea media		
Commelina cyanea	Scurvy Weed	1
Echinopogon caespitosus var. *caespitosus*	Hedgehog Grass	1
Conyza bonariensis	Flax-leaved Fleabane	1
Fimbristylis dichotoma		
Dianella revoluta		

PLOT 2

*Community – Spotted Gum Ironbark Woodland

*Date – 19/02/09
AMG Ref. E – 347727
N - 6387465
*Aspect – Westerly
*Soils - Sandy

*Structural Components –

Canopy	(to 15m)	%coverage = 35%
Mid Layer	(to 8m)	%coverage = 15%
Shrub Layer	(to 2m)	%coverage = 5%
Ground Cover	(to 1m)	%coverage = 60%

*Species Recorded –

Canopy Dominants		
Eucalyptus crebra	Narrow-leaved Ironbark	2
Mid Layer Dominants		
Eucalyptus crebra	Narrow-leaved Ironbark	2
Corymbia maculata	Spotted Gum	1
Shrub Layer Dominants		
Pimelea linifolia ssp. *linifolia*	Rice Flower	1
Ground Cover Dominants		
Themeda australis	Kangaroo Grass	3
Additional Species Recorded		
Lomandra multiflora ssp. *multiflora*		1
Laxmannia gracilis	Slender Wire Lily	1
Pomax umbulata	Pomax	1
Lepidosperma laterale	Swordgrass	1
Melichrus urceolatus	Jam Tarts	1
Ozothamnus diosmifolium	Everlasting	1
Cheilanthes sieberi ssp. *sieberi*	Mulga Fern	1
Aristida vagans	Three-awn Speargrass	1
Acacia falcata		1
Xanthorrhea media		1
Commelina cyanea	Scurvy Weed	1
Echinopogon caespitosus var. *caespitosus*	Hedgehog Grass	1
Dianella revoluta	Blue Flax Lily	1
Epaltes australis		1
Melaleuca thymifolia	Thyme	1
Jacksonia scoparia	Dogwood	1

APPENDIX D

EXPECTED FAUNA SPECIES LIST

EXPECTED FAUNA SPECIES LIST

Family sequencing and taxonomy follow for each fauna class:

Birds - Pizzey and Knight (1997).

Herpetofauna - Cogger (1996), Ehmann (Ed) (1997) and Barker, Grigg and Tyler (1995).

Mammals - Strahan (Ed) (1995) and Churchill (1998).

- Species observed or indicated by scats, tracks etc. on site during this investigation.

#(?) - Indicates a species identified without certainty or to a Genus level only.

@ - Indicates species previously recorded on site during the previous survey (Wildthing Environmental Consultants, 1997).

* - Indicates an introduced species.

o - Indicates waterbird species observed flying over the site and not likely to utilise the site

Threatened species addressed within this assessment appear in **bold** font.

BIRDS

Family Phasianidae - True Quails		
	Coturnix pectoralis	Stubble Quail
	Coturnix ypsilophora	Brown Quail
Family Anatidae - Ducks, Swans and Geese		
	Anas castanea	Grey Teal
	Anas gracilis	Chestnut Teal
	**Anas platyrhynchos*	Mallard
#	*Anas superciliosa*	Pacific Black Duck
#@	*Chenonetta jubata*	Australian Wood Duck
o	*Cygnus atratus*	Black Swan
Family Podicipedidae - Grebes		
#	*Tachybaptus novaehollandiae*	Australasian Grebe
Family Phalacrocoridae - Cormorants		
	Phalacrocorax carbo	Great Cormorant
	Phalacrocorax fuscescens	Pied Cormorant
	Phalacrocorax sulcirostris	Little Black Cormorant
	Phalacrocorax varius	Little Pied Cormorant
Family Ardeidae - Herons, Egrets and Bitterns		
	Ardea alba	Great Egret
@	*Ardea ibis*	Cattle Egret
	Ardea intermedia	Intermediate Egret
#	*Ardea pacifica*	White-necked Heron
	Egretta garzetta	Little Egret
	Egretta novaehollandiae	White-faced Heron
	Ixobrychus minutus	Little Bittern

@	*Nycticorax caledonicus*	Nankeen Night Heron

Family Threskiornithidae - Ibises and Spoonbills

	Platalea flavipes	Yellow-billed Spoonbill
	Platalea regia	Royal Spoonbill
#@	*Threskiornis molucca*	Sacred Ibis
	Threskiornis spinicollis	Straw-necked Ibis

Family Accipitridae - Osprey, Hawks, Eagles and Harriers

	Accipiter fasciatus	Brown Goshawk
	Accipiter cirrhocephalus	Collared Sparrowhawk
	Accipiter novaehollandiae	Grey Goshawk
	Aquila audax	Wedge-tailed Eagle
	Aviceda subcristata	Crested Hawk
	Circus approximans	Swamp Harrier
	Circus assimilis	Spotted Harrier
	Elanus notatus	Black-shouldered Kite
	Haliaeetus leucogaster	White-breasted Sea-Eagle
	Haliastur sphenurus	Whistling Kite
	Hieraaetus morphnoides	Little Eagle
	Lophoictinia isura	**Square-tailed Kite**

Family Falconidae - Falcons

	Falco berigora	Brown Falcon
	Falco cenchroides	Nankeen Kestrel
	Falco longipennis	Australian Hobby
	Falco peregrinus	Peregrine Falcon

Family Rallidae - Crakes, Rails and Gallinules

	Porphyrio porphyrio	Purple Swamphen
	Porzana fluminea	Australian Spotted Crake
	Porzana pusilla	Baillon's Crake
	Porzana tabuensis	Spotless Crake
	Rallus pectoralis	Lewin's Rail

Family Turnicidae - Button-quails

	Turnix pyrrhothorax	Red-chested Button-quail
	Turnix varia	Painted Button-quail

Family Charadriidae - Plovers, Dotterels and Lapwings

#@	*Vanellus miles*	Masked Lapwing

Family Columbidae - Pigeons, Doves

	Chalcophaps indica	Emerald Dove
	**Columba livia*	Feral Pigeon
	Geopelia humeralis	Bar-shouldered Dove
	Geopelia striata	Peaceful Dove
#	*Ocyphaps lophotes*	Crested Pigeon
	Phaps chalcoptera	Common Bronzewing
	**Streptopelia chinensis*	Spotted Turtle-Dove

Family Cacatuidae - Cockatoos and Corellas		
	Cacatua galerita	Sulphur-crested Cockatoo
@	*Cacatua roseicapilla*	Galah
	Cacatua sanguinea	Little Corella
	Cacatua tenuirostris	Long-billed Corella
	Calyptorhyncus funereus	Yellow-tailed Black-Cockatoo
	Calyptorhynchus lathami	**Glossy Black-Cockatoo**
Family Psittacidae - Parrots, Rosellas and Lorikeets		
	Alisterus scapularis	King Parrot
	Glossopsitta pusilla	Little Lorikeet
	Glossopsitta concinna	Musk Lorikeet
	Lathamus discolor	**Swift Parrot**
	Neophema pulchella	**Turquoise Parrot**
	Platycercus elegans	Crimson Rosella
#@	*Platycercus eximius*	Eastern Rosella
#	*Psephotus haematonotus*	Red-rumped Parrot
	Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet
	Trichoglossus haematodus	Rainbow Lorikeet
Family Cuculidae - Cuckoos		
	Chrysococcyx basalis	Horsefield's Bronze-Cuckoo
	Chrysococcyx lucidus	Shining Bronze-Cuckoo
	Cuculus pallidus	Pallid Cuckoo
	Cacomantis flabelliformis	Fan-tailed Cuckoo
	Cacomantis variolosus	Brush Cuckoo
	Eudynamys scolopacea	Common Koel
	Scythrops novaehollandiae	Channel-billed Cuckoo
Family Tytonidae - Barn Owls		
	Tyto alba	Barn Owl
	Tyto novaehollandiae	**Masked Owl**
Family Strigidae - Hawk-Owls		
	Ninox connivens	**Barking Owl**
	Ninox boobook	Southern Boobook
	Ninox strenua	**Powerful Owl**
Family Podargidae - Frogmouths		
	Podargus strigoides	Tawny Frogmouth
Family Caprimulgidae - Nightjars		
	Eurostopodus mystacalis	White-throated Nightjar
Family Aegothelidae - Owlet Nightjars		
	Aegotheles cristatus	Australian Owlet Nightjar
Family Apodidae - Swifts		
	Apus pacificus	Fork-tailed Swift
	Hirundapus caudacutus	White-throated Needletail

Family Alcedinidae - River Kingfishers		
	Ceyx azurea	Azure Kingfisher
Family Halcyonidae - Tree Kingfishers		
#@	*Dacelo novaeguineae*	Laughing Kookaburra
	Todiramphus sancta	Sacred Kingfisher
Family Meropidae - Bee-eaters		
	Merops ornatus	Rainbow Bee-eater
Family Coraciidae - Rollers		
#	*Eurystomus orientalis*	Dollarbird
Family Climacteridae - Treecreepers		
	Climacteris erythrops	Red-browed Treecreeper
	Climacteris picumnus victoriae	**Brown Treecreeper**
	Cormobates leucophaea	White-throated Treecreeper
Family Maluridae - Fairy-Wrens and Emu-Wrens		
	Malurus assimilis	Variegated Fairy-Wren
	Malurus cyaneus	Superb Fairy-Wren
	Stipiturus malachurus	Southern Emu-Wren
Family Pardalotidae - Pardalotes, Gerygones, Scrubwrens, Heathwrens and Thornbills		
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill
	Acanthiza lineata	Striated Thornbill
	Acanthiza nana	Yellow Thornbill
	Acanthiza pusilla	Brown Thornbill
	Acanthiza reguloides	Buff-rumped Thornbill
	Gerygone olivacea	White-throated Gerygone
	Pardalotus punctatus	Spotted Pardalote
	Pardalotus striatus	Striated Pardalote
	Pyrrholaemus sagittatus	**Speckled Warbler**
	Sericornis frontalis	White-browed Scrubwren
	Sericornis pyrrhopygius	Chestnut-rumped Heathwren
	Smicrornis brevirostris	Weebill ***)***
Family Meliphagidae - Honeyeaters		
	Acanthorhynchus tenuirostris	Eastern Spinebill
	Anthrochaera carunculata	Red Wattlebird
	Anthrochaera chrysoptera	Brush Wattlebird
	Entomyzon cyanotus	Blue-faced Honeyeater
	Epthianura albifrons	White-fronted Chat
	Grantiella picta	**Painted Honeyeater**
	Lichenostomus chrysops	Yellow-faced Honeyeater
	Lichenostomous leucotis	White-eared Honeyeater
	Lichenostomus melanops	Yellow-tufted Honeyeater
	Lichenostomus penicillatus	White-plumed Honeyeater
	Lichmera indistincta	Brown Honeyeater
#@	*Manorina melanocephala*	Noisy Miner
	Manorina melanophrys	Bell Miner
	Meliphaga lewinii	Lewin's Honeyeater
	Melithreptus brevirostris	Brown-headed Honeyeater
	Melithreptrus gularis gularis	**Black-chinned Honeyeater**
	Melithreptus lunatus	White-naped Honeyeater

	Myzomela sanguinolenta	Scarlet Honeyeater
	Philemon citreogularis	Little Friarbird
	Philemon corniculatus	Noisy Friarbird
	Phylidonyris novaehollandiae	New Holland Honeyeater
	Phylidonyris melanops	Tawny-crowned Honeyeater
	Phylidonyris nigra	White-cheeked Honeyeater
	Plectorhyncha lanceolata	Striped Honeyeater
	Xanthomyza phrygia	**Regent Honeyeater**

Family Petroicidae - Robins and Jacky Winter

	Eopsaltria australis	Eastern Yellow Robin
	Microeca leucophaea	Jacky Winter (Brown Flycatcher)
	Petroica multicolor	Scarlet Robin
	Petroica phoenicea	Flame Robin
	Petroica rosea	Rose Robin

Family Pomatostomidae - Australian Babblers

	Pomatostomus superciliosus	White-browed Babbler
#	***Pomatostomus temporalis temporalis***	**Grey-crowned Babbler**

Family Cinclosomatidae - Whipbird and Quail-thrushes

	Cinclosoma punctatum	Spotted Quail-thrush

Family Neosittidae - Sitellas

	Daphoenositta chrysoptera	Varied Sitella

Family Pachycephalidae - Whistlers, Shrike-tit and Shrike-thrushes

	Colluricincla harmonica	Grey Shrike-thrush
	Falcunculus frontatus	Crested Shrike-tit
	Pachycephala olivacea	**Olive Whistler**
	Pachycephala pectoralis	Golden Whistler
	Pachycephala rufiventris	Rufous Whistler

Family Dicruridae - Monarchs, Flycatchers, Fantails, Drongo and Magpie-Lark

	Dicrurus megarhynchus	Spangled Drongo
	Monarcha melanopsis	Black-faced Monarch
	Myiagra cyanpleuca	Satin Flycatcher
	Myiagra inquieta	Restless Flycatcher
	Myiagra rubecula	Leaden Flycatcher
	Rhipidura fuliginosa	Grey Fantail
#	*Rhipidura leucophrys*	Willie Wagtail
	Rhipidura rufifrons	Rufous Fantail
#@	*Grallina cyanoleuca*	Magpie-lark

Family Campephagidae - Cuckoo-shrikes and Trillers

#	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike
	Coracina papuensis	White-bellied Cuckoo-shrike
	Coracina tenuirostris	Cicadabird
	Lalage sueruii	White-winged Triller

Family Oriolidae - Orioles and Figbird

	Oriolus sagittatus	Olive-backed Oriole
	Sphecotheres viridus	Figbird

Family Artamidae - Wood-swallows, Butcherbirds, Magpie and Currawongs		
	Artamus cyanopterus	Dusky Woodswallow
	Artamus leucorhynchus	White-breasted Woodswallow
#	*Cracticus nigrogularis*	Pied Butcherbird
#	*Cracticus torquatus*	Grey Butcherbird
#@	*Gymnorhina tibicen*	Australian Magpie
#	*Strepera graculina*	Pied Currawong
Family Corvidae - Crows, Raven		
#@	*Corvus coronoides*	Australian Raven
Family Corcoracidae - Mudnest-builders		
	Corcorax melanorhamphos	White-winged Chough
Family Motacillidae - Pipits and Wagtails		
	Anthus novaseelandiae	Richard's Pipit
Family Passeridae - Sparrows, Grassfinches, Mannikins		
	Neochmia temporalis	Red-browed Finch
	Lonchura castaneothorax	Chestnut-breasted Mannikin
	**Passer domesticus*	House Sparrow
	Poephila bichenovii	Double-barred Finch
	Poephila guttata	Zebra Finch
Family Fringillidae - Other Finches		
	**Carduelis carduelis*	European Goldfinch
Family Dicaeidae - Flowerpeckers		
	Dicaeum hirundinaceum	Mistletoebird
Family Hirundinidae - Swallows and Martins		
	Cecropis ariel	Fairy Martin
@	*Cecropis nigricans*	Tree Martin
	Cheramoeca leucosternus	White-backed Swallow
@	*Hirundo neoxena*	Welcome Swallow
Family Sylvidae - Old World Warblers		
	Acrocephalus stentoreus	Clamorous Reed-Warbler
	Cinclorhamphus mathewsi	Rufous Songlark
	Cisticola exilis	Golden-headed Cisticola
	Megalurus gramineus	Little Grassbird
	Megalurus timoriensis	Tawny Grassbird
Family Zosteropidae - White-eyes		
	Zosterops lateralis	Silvereye
Family Sturnidae - Starlings and Mynas		
#@	**Acridotheres tristis*	Common Myna
#	**Sturnus vulgaris*	Common Starling

AMPHIBIANS

Family Myobatrachidae - 'Southern Frogs'		
#@	*Crinia signifera*	Common Eastern Froglet
	Limnodynastes dumerilii	Eastern Banjo Frog
	Limnodynastes ornatus	Ornate Burrowing Frog
	Limnodynastes peronii	Striped Marsh Frog
#	*Limnodynastes tasmaniensis*	Spotted Grass Frog
	Pseudophryne bibronii	Brown Toadlet
	Pseudophryne coriacea	Red-backed Toadlet
	Uperoleia fusca	
#	*Uperoleia laevigata*	Smooth Toadlet
Family Hylidae - Tree Frogs		
	Litoria aurea	**Green and Golden Bell Frog**
	Litoria caerulea	Green Tree Frog
	Litoria chloris	Red-eyed Green Tree Frog
	Litoria dentata	Bleating Tree Frog
#	*Litoria fallax*	Dwarf Tree Frog
	Litoria freycineti	Freycinet's Frog
	Litoria gracilenta	Dainty Tree Frog
	Litoria jervisensis	Jervis Bay Tree Frog
#	*Litoria latopalmata*	Broad-palmed Frog
	Litoria lesueuri	Lesueur's Frog
#	*Litoria nasuta*	Rocket Frog
#@	*Litoria peronii*	Peron's Tree Frog
	Litoria phyllochroa	Green Leaf Tree Frog
	Litoria tyleri	Tyler's Tree Frog
	Litoria verreauxii	Verreaux's Tree Frog

REPTILES

Family Chelidae - Tortoises	
Chelodina longicollis	Eastern Snake-necked Tortoise
Family Gekkonidae - Geckoes	
Diplodactylus vittatus	Wood Gecko
Oedura lesueurii	Lesueur's Velvet Gecko
Underwoodisaurus milii	Thick-tailed Gecko
Family Pygopodidae - Legless Lizards	
Lialis burtonis	Burton's Snake-lizard
Pygopus lepidopus	Common Scaly-foot
Family Agamidae - Dragons	
Amphibolurus muricatus	Jacky Lizard
Physignathus lesuerii	Eastern Water Dragon
Pogona barbata	Eastern Bearded Dragon
Family Varanidae - Monitors	
Varanus gouldii	Gould's Monitor
Varanus varius	Lace Monitor

Family Scinidae - Skinks

#	*Carlia tetradactyla*	Southern Rainbow Skink
	Carlia vivax	Tussock Rainbow Skink
	Cryptoblepharus virgatus	Wall Lizard
	Ctenotus robustus	Striped Skink
	Ctenotus taeniolatus	Copper-tailed Skink
	Egernia modesta	
	Egernia saxatilis	Black Rock Skink
	Egernia whitii	White's Skink
	Eulamprus heatwolei	
	Eulamprus quoyii	Eastern Water Skink
	Eulamprus tenuis	
	Lampropholis delicata	Grass Skink
	Lampropholis guichenoti	Garden Skink
	Lygisaurus foliorum	
	Pseudomoia platynota	Red-throated Skink
	Saiphos equalis	Three-toed Skink
	Saproscincus mustelinus	Weasel Skink
	Tiliqua scincoides	Eastern Blue-tongued Lizard

Family Typhlopidae - Blind Snakes

Ramphotyphlops nigrescens	
Ramphotyphlops proximus	
Ramphotyphlops wiedii	

Family Boidae - Pythons

Morelia spilota	Carpet (Diamond) Python

Family Colubridae

Boiga irregularis	Brown Tree Snake
Dendralaphis punctulata	Green Tree Snake

Family Elapidae - Venomous Snakes

Acanthopis antarcticus	Death Adder
Cacophis krefftii	Dwarf Crowned Snake
Cacophis squamulosus	Golden Crowned Snake
Demansia psammophis	Yellow-faced Whip Snake
Furina diadema	Red-naped Snake
Hemiaspis signata	Black-bellied Swamp Snake
Hoplocephalus bitorquatus	**Pale-headed Snake**
Hoplocephalus stephensii	**Stephen's Banded Snake**
Notechis scutatus	Eastern Tiger Snake
Pseudechis guttatus	Spotted Black Snake
Pseudechis porphyriacus	Red-bellied Black Snake
Pseudonaja textilis	Eastern Brown Snake
Rhinoplocephalus nigrescens	Eastern Small-eyed Snake
Vermicella annulata	Bandy Bandy

<u>MAMMALS</u>

Family Tachyglossidae - Echidna

Tachyglossus aculeatus	Echidna

Family Dasyuridae - Dasyurids		
	Antechinus flavipes	Yellow-footed Antechinus
	Antechinus swainsonii	Dusky Antechinus
	Antechinus stuartii	Brown Antechinus
	Dasyurus maculatus maculatus	**Tiger Quoll**
	Phascogale tapoatafa	**Brush-tailed Phascogale**
	Sminthopsis murina	Common Dunnart
Family Peramelidae - Bandicoots		
	Isoodon macrourus	Northern Brown Bandicoot
	Perameles nasuta	Long-nosed Bandicoot
Family Phascolarctidae - Koala		
	Phascolarctos cinereus	**Koala**
Family Vombatidae - Wombats		
	Vombatus ursinus	Common Wombat
Family Petauridae - Gliders		
	Petaurus breviceps	Sugar Glider
	Petaurus norfolcensis	**Squirrel Glider**
Family Pseudocheiridae - Ringtail Possums and Greater Glider		
	Petauroides volans	Greater Glider
	Pseudocheirus peregrinus	Common Ringtail Possum
Family Acrobatidae - Feathertail Glider		
	Acrobates pygamaeus	Feathertail Glider
Family Phalangeridae - Brushtail Possums		
	Trichosurus vulpecula	Common Brushtail Possum
Family Macropodidae - Kangaroos, Wallabies		
#@	*Macropus giganteus*	Eastern Grey Kangaroo
	Macropus robustus	Common Wallaroo
	Macropus rufogriseus	Red-necked Wallaby
	Wallabia bicolor	Swamp Wallaby
Family Pteropodidae - Fruit Bats		
	Pteropus poliocephalus	**Grey-headed Flying-fox**
	Pteropus scapulatus	Little Red Flying-fox
Family Rhinolophidae - Horseshoe-bats		
	Rhinolophus megaphyllus	Eastern Horseshoe-bat
Family Molossidae - Freetail-bats		
	Mormopterus norfolkensis	**Eastern Freetail-bat**
#?	*Mormopterus* sp 2	Freetail-bat sp.
	Mormopterus sp.	Freetail-bat sp.
#	*Nyctinomus australis*	White-striped Freetail-bat

Family Vespertilionidae - Plain-nosed Bats		
	Chalinolobus dwyeri	**Large-eared Pied Bat**
#?	*Chalinolobus gouldi*	Gould's Wattled bat
	Chalinolobus morio	Chocolate Wattled Bat
	Miniopterus schreibersii oceanensis	**Large Bentwing-bat**
	Nycticeius greyii	Little Broad-nosed Bat
	Nyctophilus geoffroyi	Lesser Long-eared Bat
	Nyctophilus gouldii	Gould's Long-eared Bat
	Scotorepens orion	Eastern Broad-nosed Bat
	Vespadelus darlingtoni	Large Forest Bat
	Vespadelus pumilus	Eastern Forest Bat
	Vespadelus regulus	Southern Forest Bat
	Vespaledus vulturnus	Little Cave Bat
	Vespadelus sp.	
Family Muridae - Rodents		
	Hydromys chrysogaster	Water Rat
	Melomys burtoni	Grassland Melomys
@	**Mus musculus*	House Mouse
	Rattus fuscipes	Southern Bush Rat
	Rattus lutreolus	Swamp Rat
	**Rattus norvegicus*	Brown Rat
	**Rattus rattus*	Black Rat
	Pseudomys novaehollandiae	New Holland Mouse
Family Canidae		
	**Vulpes vulpes*	Red Fox
#	**Canis familiaris*	Dog
	Canis familiaris dingo	Dingo
Family Felidae		
	**Felis catus*	Cat
Family Leporidae		
#	**Lepus capensis*	European Hare
#@	* *Oryctolagus cuniculus*	European Rabbit
Family Equidae		
	**Equus asinus*	Donkey
	**Equus caballus*	Horse
Family Suidae		
	**Sus scrofa*	Feral Pig
Family Bovidae		
#@	**Bos taurus*	Cow
	**Capra hircus*	Goat

Attachment 3 – Archaeological and Geomorphological Assessment Report

MARY DALLAS
CONSULTING
ARCHAEOLOGISTS

CULTURAL RESOURCE ASSESSMENT, PLANNING AND MANAGEMENT

Archaeological and Geomorphological Assessment of Proposed Subdivision of Rural Land Dalwood Acres, Stages 4 & 5, Hunter Valley.

Mary Dallas and Roslyn Kerr

1997

to be appended to: Barton, H. 1996 Archaeological Survey of a Proposed Subdivision at Dalwood Acres, Branxton Hunter Valley as Appendix 4.

Report to Pulver Cooper and Blackley Pty Limited

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1.0 INTRODUCTION

This report documents the archaeological study of a proposed subdivision of rural land known as Dalwood Acres at Branxton, Hunter Valley, NSW. The study was commissioned by Pulver Cooper & Blackley Pty Limited, Project Managers for the owner.

The study is presented as an appendix to an earlier study of an immediately adjacent subdivision. The report on the previous study was prepared by Huw Barton for Mary Dallas Consulting Archaeologists for Pulver Cooper & Blackley Pty Limited.

This report should be referred to as:

> Dallas, M. & Kerr, R. 1997 Archaeological and Geomorphological Assessment of Proposed Subdivision of Rural Land Dalwood Acres, Stages 4 and 5, Hunter Valley. **APPENDIX 4 :** Barton, H. 1996 Archaeological Survey of a Proposed Subdivision at Dalwood Acres, Branxton, Hunter Valley.

The study was undertaken by Mary Dallas Consulting Archaeologists and Roslyn Kerr Geological and Environmental Consultant in consultation with the Mindaribba Local Aboriginal Land Council [LALC] through the Chairmain, Mr Rick Griffiths.

1.1 Study Aims

The aims of the project were:

1. to identify, record and assess Aboriginal sites within the proposed subdivision area;
2. to assess the impact, both direct and indirect, of the proposed subdivision on any sites located by the survey;
3. to assess the results of the geotechnical investigations, which were conducted at the time of the archaeological survey, in terms of the subsurface potential of the area to contain buried archaeological deposit;
4. to determine the significance of any sites located from both an archaeological and Aboriginal perspective;
5. to liaise with the Mindaribba Local Aboriginal

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Land Council [LALC] to determine local Aboriginal interest in the area; and,

6. to advise on the protection and management of any sites located.

1.2 Appendix Outline

This Appendix:

1. Draws on the background information provided in the Barton 1996 report on local and regional archaeology for the area and its environmental context
2. Documents the archaeological field survey, strategy and results.
3. Provides an assessment of a geotechnical investigation conducted at the time of the survey by Coffey & Partners International Pty Limited.
4. Provides a geomorphological assessment of the land in terms of the potential it has for buried Aboriginal sites.
5. Describes the Aboriginal consultation carried out in the course of the study.
6. Describes two sites located by the survey, a Scarred Tree and an Axe Grinding Groove Site located by the survey and provides management recommendations on their preservation and protection within the context of the housing subdivision.

1.3 Authorship

This report was written by Mary Dallas and Roslyn Kerr, who undertook a specialist geomorphological assessment of the site in terms of Aboriginal site potential.

The field survey was undertaken by Mary Dallas of Mary Dallas Consulting Archaeologists and Ms Roslyn Kerr. The Mindaribba Local Aboriginal Land Council was represented in the field by Mr Ronald Griffiths, Ms Lee-anne Miller and Mr Steve Talbot.

2.0 ABORIGINAL CONSULTATION

The study area falls within the boundaries of the Mindaribba Local Aboriginal Land Council. Mr Rick Griffiths, Chairman of the LALC, was contacted prior

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to the field survey and the project was discussed with him prior to the field investigation. Mr Ronald Griffiths, Ms Lee-anne Miller and Mr Steve Talbot represented the Land Council and assisted the field team throughout the course of the field investigation.

The Mindaribba LALC has been commissioned to prepare a report on the survey and their interests in the land and the site located. Their report, on receipt should be appended to this report and consideration should be given to any recommendations made by the Mindaribba LALC.

3.0 THE STUDY AREA

3.1 Study Locality

The proposed subdivision is located approximately 2.5km north of the township of Branxton [Figure 1] in the Hunter Valley of NSW.

The subject land comprises Lot 404 in DP 866648 & Lot 69 [land comprised in S.A.32/96] and falls on the Greta 1:25000 sheet. The proposed subdivision covers about 47ha.

The land is situated immediately to the north of the Dalwood Acres subdivision previously investigated by Mary Dallas Consulting Archaeologists and constitutes Stages 4 and 5 of the total subdivision proposal.

Access is via the New England Highway, turning eastward into Dalwood road, branxton, and northward into McMullins Road, then eastward into Rusty Lane. The site lies on the southern side of Rusty Lane.

3.2 Environmental Context

Geology

The subject land is located in the northeastern part of the Sydney Basin, a structural basin containing sedimentary rocks of Permian and Triassic age. According to the Newcastle Coalfield Regonal Geological Map at 1:100,000 scale [Hawley et al 1995] Early Permian sedimentary rocks of the Branxton Formation underlie the site. The Branxton Formation

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is the lowest formation of the Maitland Group and overlies the Greta Coal Measures.

Rock types of this Formation include conglomerate, sandstone and siltstone and contains fossils of marine animals, for example, bryozoans, brachiopods and crinoids. These rocks are interpreted as having been deposited as sediments in a shallow marine environment. Gravel and sand were deposited on beaches and in fan deltas, whereas finer grained sand and silt were deposited on a marine shelf. The source area for the sediments lay to the north and northwest, in the New England Fold Belt.

'Dropstones' are common in the sandstone of the Branxton Formation. They are iolated pebbles or cobbles, of much larger grainsize than the host rock, and consist of hard, resistant rock types such as quartzite. Their presence suggests deposition from melting ice. The ice was probably derived from thawing streams, formed during winters in a cool to cold temperature climate that was thought to have occurred in the early Permian [G.McClung in Herbert & Helby 1980]. River gravel carried in the ice dropped onto the sandy sea floor as the ice rafts melted.

After burial and lithification of the marine sediments the strata were folded into a large southerly plunging anticline, termed the Lochinvar Anticline, and uplifted. The site lies on the western side of the anticline and the strata dip to the west at about 15 degrees. Younger overlying Permian strata, including the Wittingham and Wollombi coal measures, as well as the overlying Triassic rocks, have been removed by erosion from the area.

Erosion of the Permian and Triassic rocks in the Hunter Valley may have begun in the Cretaceous Period, during uplift of the present east coast which accompanied rifting, sea-floor spreading and subsequently the creation of the Tasman Sea. This suggests the landscape may have been eroding for much of the last 90 million years, to produce the undulating rises and low hills which form the central part of the Hunter Valley today.

The 1:100,000 geological map [Hawley et.al.1995] does not show any Quaternary alluvium in the subject area. The nearest Quaternary alluvium occurs 2.4km to the north and 2km to the southeast, adjacent to the Hunter River and Dalwwod Creek, respectively.

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However, localised areas of alluvium adjacent to small tributaries of the Hunter could not be represented on a map of this scale.

Soil Landscapes

A soil landscape is an area of land with unique landform features, containing a characteristic set of soils. The Branxton-Greta area lies on the Singleton 1:250,000 soil landscape sheet which shows the subjecvt area as the Rothbury Soil Landscape. The features of this soil landscape as described by Kovac & Lawrie [1991] are given below.

The Rothbury Soil Landscape is an erosional landscape developed on sedimentary rocks of Permian age. It covers undulating and rolling low hills with elevations ranging from 60-140m. Average slopes are 6-10% with some to 12%.

Native vegetation is a woodland of spotted gums, forest red gums, stringybark and ironbark./ Paperbarks occur in some portions of the drainage lines **[Plate 4]**.

Red podzolic soils occur on upper slopes, Yellow Podzolic Soils occur on midslopes, and Yellow Solodic Soils and brown soloths occur on lower slopes. There are Prairie Soils in the drainage lines. The podzolic soils and soloths are texture contrast soils with brown, yellow brown or dark brown sandy or loamy topsoil and a clay subsoil. The clay subsoil is reddish brown on the crests and a brown or yellowish grey or brown with colour mottling downslope of the crests. Depth to bedrock is at least 0.9m for the red podzolic soils, 0.8m for the yellow podzolic soils, 1.1m the yellow solodic soils and 0.6m for the brown soloths.

Topography and Drainage

The study area is gently undulating with a maximum relief of about 35m. A north tending ridge in the western part of the study area has an elevation of 90-95m, affording views to the hills of carboniferous rocks north and east of the Hunter River **[see Plate 8]**. From the ridge the land slopes to the northwest and northeast, reaching its lowest point of 60m in the northeastern corner.

Intermittant streams on the eastern side of the ridge

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[Plate 4] drain into Dalwood Creek, a tributary of the Hunter. The smaller catchment on the western side of the ridge drains into intermittant streams which flow northward to the Hunter. The meandering Hunter River lies 2.4km north of the site and 2.75km southeast of the site.

Land Use

The land is mostly pasture and currently supports horse grazing [Plate 5]. The trees are sparse on the ridges and slopes. Upended tree stumps litter the paddocks. A wooded area covers the northwestern section of Portion 143, in the far southwestern corner of the property [Plate 6]. There is also evidence of ploughing in places [Plate 8]. Three farm dams have been constructed on the site.

3.3 Archaeological Context

The background information provided by Barton [1996] remains appropriate for the present subdivision site and is not re-presented in this appendix. None of the known sites in the region would be affected by the proposed subdivision.

4.0 FIELD INVESTIGATION

4.1 Methods and Procedures

Maps and Plans at 1:25,000 and 1:2,000 were used in the field. The study boundaries were located in the field relative to property fence lines.

The study area was comprehensively surveyed for Aboriginal sites on Monday 29th of September. The field team conducted a series of transects at approximately 50m intervals. All drainage lines were inspected, and all areas of elevated level ground were covered. Roslyn Kerr concentrated on the geotechnical excavations, creek sections, surface exposures. She recorded soil profiles [see Appendix 1] exposed by the test pits.

Particular attention was paid to any areas exhibiting surface exposures, eroded surfaces or areas affording surface or subsurface visibility. These included vehicle tracks, walking and animal tracks and areas of disturbance such as erosional surfaces, scours and

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denuded or exposed clays and bedrocks. Soils and gravels in the roots of the tree stumps which have been bulldozed into rows throughout the western portion of the site were also inspected. Ground visibility varied throughout the study area between 20-100%. Visibility was generally poor to reasonable being limited largely by pasture grass. Visibility was afforded by exposures resulting from denudation, vehicular or foot traffic, animal tracks, clearing and erosion. Sandstone bedrock is exposed in the eastern creeks and slopes.

4.2 Field Investigation

The archaeological survey of the study area was fully comprehensive. Surface exposures were inspected for archaeological remains and subsurface profiles were investigated through the observation of a series of geotechnical investigations undertaken by Coffey & Partners International Pty Limited at the same time as the archaeological survey.

Two sites were identified by the survey. No remains were identified by the observation of the subsurface geotechnical investigations [seee below].

Surface visibility over the study area varied but was generally between 20 and 100%. Low surface visibility was the result of patchy pasture grass or areas of high leaf litter within wooded areas. Exposures [80-100% visibility] are located along vehicular and animal tracks and on eroded surfaces along the watercourses, slopes and ridge lines and along fence lines. Exposures are located in each of the areas where Aboriginal sites might be expected to be located ie., level ground on the ridgecrests, creek flats and flanks, and to a lesser extent on the more level areas of hill slopes. The distribution of these features represents over 80% of the likely site locations within the study area.

Likely open site locations within the study area would be on flatter ground along the ridge crests and along the creek flanks. However, the potential of the subdivision area to contain Aboriginal sites is limited by a number of factors. These relate to:

1. the nature and extent of previous land use disturbances. These factors contribute to the disturbance or destruction of sites. The rolling

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terrain suggests camping sites may be located throughout the study area - on the ridge crest and relatively level areas on the slopes and on elevated areas along the drainage lines. Disturbances in these areas include vegetation clearance, ploughing, erosion of top soils, dam construction and flood scouring. The timber clearance of the ridge crest and slopes has involved bulldozing of the tree stumps into rows disturbing surface and subsurface deposit throughout the area.

2. the degree of surface visibility and subsurface exposure. These factors effect site detection on the surface and provide an indication of the potential of the area to contain potential artefact bearing deposit. Within the study area visibility and conditions relating to site detection was variable. Potential artefact bearing deposit within the study area is limited to level elevated areas above the creek flats and on the elevated ridge crests.

3. availability of suitable source material for artefact manufacture. Stone within the study area includes 'Dropstones' of quartzite and bedrock sandstone exposed on the slopes or forming the beds of the eastern tending streams contains some quartz nodules. These stone types and other types found in the area, such as indurated sandstone and porphyry, were used by Aboriginal tool-makers [see discussion below].

4. Age of timber. Trees with scarring to which an Aboriginal origin might be attributed should be at least 60-80 years old as this cultural practice probably ceased following early land occupation and subdivision.

4.3 Geomorphological Investigation and Archaeological Potential of the Study Area

Soil Profiles

A geotechnical engineer from Coffey & Partners International Pty Limited directed the digging of 15 backhoe pits over the site for geotechnical investigation. Figure 2 shows their locations. The numbering system continues on from the geotechnical investigations in the subdivision to the south. The pit measures 3m long, 0.6 or 1.2m wide, and up to 1.7m deep. The soils exposed by the excavation were

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examined [but not sieved] for Aboriginal artefacts. Sections were also examined for artefacts and features such as hearths or other cultural material. Soil profiles in thriteen of the backhoe pits were logged Details are provided in **Appendix 1.**

Soil profiles exposed in the test backhoe pits reveal that the topsoil is of uniform composition over the area. The topsoil consists of brown sandy loam with abundant fine grass roots. Its thickness varies from 0.05m to 0.18m, and it grades down to the underlying unit. The second layer is typically a bleached layer of light brown saandy loam with grass roots. It usually contains scattered pebbles which in some intersections are concentrated in the lower part of the unit. The layer extends to a depth ranging from 0.12 to 0.44m, and has a sharp base.

The third layer, subsoil, is characterised by orange iron oxide mottling **[Plate 12]**. It is typically a grey sandy clay, or less commonly a grey clay, or rarely a clayey sand. The Layer contains scattered woody roots and rare charcoal fragments. In half of the test pits, scattered pebbles are present in this layer. The base of the unit ranges from 0.50 to 1.70m.

Weathered bedrock of grey clayey sandstone with orange iron oxide mottles was encountered at the bottoms of all pits. Pebbles are present at some intersections of weathered bedrock. The depth to weathered bedrock commonly appears to be related to [but not exclusively] the position of the slope. On the ridge top weathered bedrock lies 0.06m below the surface [test pits 26 & 34]. On the midslopes and lower slope weathered bedrock lies up to 1m below the surface, while in the gully [test pit 31] it lies at 1.7m.

Bedrock and Archaeological Potential

Flat outcrops of sandstone occur on the ridge top and midslopes. Creek gullies on the eastern of the area also expose sanstone. The sandstone is medium and coarse grained with very coarse, granular and pebbly phases. Bands of poorly sorted pebbles are common. One exposure of sandstone containing finer grained charcteristics was identified in the bed of an ephemeral creek in the eastern portion of the study area. Although the creek is normally dry, several small potholes **[Plate 2]** contained water [see also Site Descriptions below].

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Pebbles in the sandstone [4-64mm] consist of sub-rounded red and brown jaspers, white, grey, black and pink quartzites and rounded white quartz-feldspar porphyry. Cobbles up to 140mm comprise brown, fine grained, indurated sandstone and white. Dropstones **[Plate 9]** are characteristic. It is possible that erosion of dropstones from the sandstone in the creek bed produced the potholes. Grooves can develop around each pebble in a sandstone context at the intersection of the sandstone matrix [Ollier 1984]. The pebble is eventually eroded out of the sandstone leaving a hole. The resulting holes can be enlarged by the action of running water, forming rock pools which can be used as lubricate the axe grinding groove process.

Cobbles of suitable size and shape eroded from the sandstone may have been used to make large stone implements. In particular, the brown, fine grained indurated sandstone and the porphyry would have been suitable rock types for making choppers and hatchets. The rock types constituting the pebbles, mainly jasper and quartzite, would have had limited use for stone tool manufacture. Although the roick types are siliceous and hard, stress from metamorphism prior to the rock becoming a pebble has induced a network of potential hairline fracture lines along which the rock would break during the flaking process. The existence of these fine cracks probably accounts forthe fact that these rock types are not found larger than pebble size [<64mm].

Soil Genesis and Archaeological Potential

To predict the potential for surface or subsurface archaeological deposits, their distribution, depth, degree of disturbance, the nature of the surface and subsurface material has to be determined. Layers of unconsolidated material beneath the ground can be of either depositional origin [geological strata] or soil horizons and weathered bedrock. It may be difficult in some places to distinguish geological layering from pedogenic horizons.

Geological Layering comprises sediments transported to the site and laid down by water [eg. alluvium], by wind [eg. sand dunes or sheets of aeolian sand], and by mass movement [eg. colluvium - loose deposits on hillsides]. The oldest layers will be at the bottom.

Soil Horizons are formed in pace. They can develop on solid rock, or on unconsolidated sediments.

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Layering produced by the weathering and soil forming processes is quite different from that produced by depositional procesess. In a soil profile of two or more parts, all the horizons may form simultaneously, for example, by washing clay out of the upper horizon into the lower horizon by through-flow [Ollier & Pain 1996]. Therefore all layers are the same age.

All of the test pits examined on the subject area exposed a soil profile typical of a red-yellow podzolic soil. Red-yellow podzolic soils are characterised by a low accummulation of surface organic matter, a deep zone of eluviation, and a thick illuviated zone in which oxidation and hydrolysis of iron produce red and yellow colours [Olliers 1984]. The topsoil and second layer are sandy, whereas the third layer is a sandy clay wqith orange iron oxide mottles. It is pebbly in places.

The composition of fresh sandstone is quartz-lithic with a white clay matrix. On weathering the sandstone breaksdown to a clayey sandy material which is iron stained in places. The clay comes from the matrix and the chemical weathering of some lithic grains. Iron oxide cements tend to hydrate to hydroxides and the iron migrates to accumulates as mottles, concreting and banding.

In the soil forming process, a texture contrast or duplex soil is produced from the weathered sandstone. Clay and other fine mineral particles are washed down the profile [eluviation], leaving coarser particles [sand and gravels] in the upper layers **A Horizon**, and forming a clay rich layer **B Horizon** beneath.

Layer 1 [topsoil] can be designated as the A1 horizon
Layer 2 [bleached zone, sharp base] is the A2 horizon
Layer 3 is the B horizon
Sandstone bedrock [parent material] is the C horizon

Pebbles and cobbles present in the fresh sandstone become concentrated in the A2 horizon. They are also scattered through the B horizon in some pits. In some pits gravel is concentrated in the lower part of the A2 horizon [eg. in Test Pit 43]. The rock types, grain size and shape of the clasts are the same as that of pebbles and cobbles in the fresh and weathered bedrock, indicating that they come from the sandstone **[Plate 10]**. The gravel layer does not display any features that suggest deposition by running water. The clasts are poorly sorted, randomly

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orientated and no internal bedding is evident. Some clasts have broken faces, which probably occurred during weathering. The observations strongly suggest that the gravel layer is part of the soil profile and is, therefore, the same age as the other horizons. The underlying weathering sandstone has only scattered pebbles, indicating a high degree of grainsize separation during the soiul forming process. However there could have been some local mass movement to account for such a high level of gravel here. Downslope movement and soil formation cannot always be separated.

Summary

The ridgecrest and hillslopes are mantled with a texture-contrast soil that does not show any evidence of disruption by recent erosional or depositional processes. However the topsoils have been disrupted by ploughimg in some places, dam contruction, horse and cattle trampling and from bulldozing of the uprooted tree stumps. Any artefacts found in this context would not be in situ and may not bew close to their original poistion.

Artefacts dropped on the surface, may over time have become incorporated into the A2 horizon by bioturbation associated with the soil formation processes. The A1 horizon grades into the A2 horizon, and both have a similar texture, [apart from the gravel] and contain roots. Artefacts found in this layer would not be in situ vertically. It is highly unlikely that artefacts would be found below the A2 horizon as biological activity is very limited below this layer, the soil hooooorizons are of the same age, and the soil forming processes concentrate coarse particles in the A2 horizon. Therefore, subsurface artefacts are unlikely to be found below a depth of .5m in the study area.

4.4 Archaeological Survey and Results

Site Descriptions

One Scarred Tree and an Axe Grinding Groove Site were located by the survey. The sites are coded **DA 1** and **DA 2**. Their locations are shown on **Figure 2**. Their locations have been accurately plotted relativeto the subdivision by land survey. Both sites have been recorded on NPWS Standard Site Recording Forms which are provided in **Appendix 4**.

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DA 1 : Scarred Tree

Map Reference: Greta 1:25,000 **357900 6381200**
Site Location: Site is located on the northern flank of the uppermost reach of an ephemeral creek [40m distant] immediately below a ridge crest/spur. Degree of slope is less than 30 degrees.
[see Plates 4 and 5]
Tree: The tree is an ironbark approximately 20m high. with a grith of 2.37m
Scar: 1435mm in length x260mm wide x25mm deep. Probably a large coolamon or shield. Scar is on the north facing side of the tree. There are axe marks at the base of the scar and insect damage to the exposed wood.
Condition: Fair. The tree is apparently healthy, with some slight insect damage to the scar.
Archaeological Significance:
Scarred Trees rarely survive land clearance, natural deterioration and bushfire regimes. As a site type they rare and represent an aspect of Aborigial wood technology and wooden artefact manufacture.
Management Recommendation:
Preserve site, ongoing consultation with the Mindaribba LALC.

DA 2 : Axe Grinding Grooves

Map Reference: Greta 1:25,000 **357650 6381250**
Site Location: A series of 6 axe grinding grooves associated with 5 rock pools are located on an exposure of sandstone in the upper reaches of an ephemeral creek. The site is approximately 50m SE of **DA 1.**
Groove Dimensions:

1. 23x8.5x1.1cm
2. 36x9x1.1cm
3. 20x6x0.8cm
4. 12.5?x5x0.5cm
5. 25x6x0.5cm
6. 26x7.5x0.8

[see Site Plan in Appendix 4]
Condition: Good. There has been some vehicle damage to the adjacent sandstone surfaces but not over the grooves or rock pools. Portions of the sandstone platform are weathered and exfoliating suggesting different times of exposure. The grooves are clear.
Archaeological Significance: These sites relate to stone tool maintenance and the manufacture of the working edge on a hatchet. They are not uncommon in the region but are limited to the distribution of sandstone.

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Management Recommendation:
Preserve site, ongoing consultation with the Mindaribba LALC [see Recommendations].

5.0 CONCLUSIONS AND RECOMMENDATIONS

Red-Yellow podzolic soils cover the study area. It has developed from pebbly sandstone of the Branxton Formation which outcrops and underlies the area. Cobbles weathered from the sandstone could have provided the Aboriginal owners with a stone source for tool manufacture. Surface and subsurface disturbances caused by ploughing, bulldozing of uprooted tree stumps and stock trampling is likely to have caused disruption of the topsoil deposit. Any artefacts found in this layer is not likely to be insitu. Sub-surface archaeological potential is likley to be confined within 0.5m of the ground surface and to have been relocated vertically and possibly horizontally by the soil forming processes. No stone artefacts or other cultural material such as hearths were found in any of the geotechnical test pits or in the material excavated from them.

The archaeological survey located two Aboriginal sites on the subject land. These are an Axe Grinding Groove Site [Plate 2] and a Scarred Tree Site [Plate 1] located in the eastern portion of the subdivision. The precise locations of the sites were determined by land survey. Both the sites fall within the proposed Lot 119. The sites should be managed for preservation and protection within the context of the subdivision.

Management of these sites could involve the following:

1. reservation within an open space area enclosing both sites. It is not recommended that the sites be separated geographically within the subdivision or that they be enclosed in a limited space with limited access or lacking in an environmentally sensitive curtilage.

The reservation of the sites in a public park would allow their interpretation in the local context

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and as examples of the Aboriginal owners material culture and their cultural heritage. Appropriate signage could be erected on site and naming of the reserve and interpretative material should highlight the importance of the sites to the Aboriginal community and their protected legal status.

The Mindaribba LALC should be consulted on the signage and interpretative material.

Ongoing management of the sites would require the co-operation of Local Government and the mindaribba LALC. The LALC may for example require a periodic monitor of the sites and the reserve to ensure ongoing preservation and mitigation measures are put in place where threats to the sites might arise [eg. reduction of siltation, weed eradication etc].

2. reservation within a subdivision lot by placing a Covenant on the block which identifies the sites, their protected legal status and providing land use or development restrictions in the vicinity of the sites.

Consultation with both the NPWS and the Mindaribba LALC should be undertaken regarding such a Covenant.

Of the two options for the management of the sites the first is the preferred for the following reasons:

1. it allows community access to the sites for local cultural tourism, recreation and education.

2. it obviously and positively celebrates the cultural heritage of the Aboriginal owners.

Recommendations

The following recommendations are made on the basis of:

1. a fully comprehensive archaeological survey of the subject land;
2. review of the NSW NPWS Aboriginal sites register;
3. consultation with the Mindaribba Local Aboriginal Land Council; and,
4. the NSW National Parks & Wildlife Act 1974 as amended which states it is illegal to deface, destroy or damage an Aboriginal relic in NSW without the prior written consent of the Director-General of the Service.

MARY DALLAS BA(HONS) SYD UNI•MAACA•31 WATERVIEW ST. BALMAIN NSW 2041•TEL (02) 9818 3287•FAX (02) 9818 4574

It is recommended that:

1. No further archaeological survey of the study area is required.

2. On receipt, the Mindaribba LALC report should be appended to this report and any recommendations contained in it should be considered prior to the subdivision development.

3. The Scarred Tree DA 1 and the Axe Grinding Groove Site DA 2 located within the proposed Lot 119 of the Subdivision [see Figure 2] should be preserved and managed for protection. Two options are provided [see above] of which the preferred management is for reservation and interpretation within an open space zone or public reserve.

4. Consultation with the Mindaribba LALC should continue regarding the adoption of the preferred management strategy.

5. Three [3] copies of this report should be forwarded to:

Ms Katherine Sale,
Sydney Zone Team
NSW National Parks & Wildlife Service
P.O. Box 1967
HURSTVILLE NSW 2220

6. A copy of this report should be forwarded to:

Mr Rick Griffiths,
Mindaribba LALC
P.O. Box 453
MAITLAND NSW 2320

6.0 REFERENCES

Barton, Huw. 1996 Archaeological Survey of a proposed subdivision at Dalwood Acres, Branxton, Hunter Valley, NSW. Report to Pulver cooper and Blackley.

Brayshaw, H. 1986b *Aborigines of the Hunter Valley.*

MARY DALLAS BA(HONS) SYD UNI•MAACA•31 WATERVIEW ST. BALMAIN NSW 2041•TEL (02) 9818 3287•FAX (02) 9818 4574

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APPENDIX 1 : LOGS OF BACKHOE PITS

Prepared by Roslyun Kerr

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APPENDIX 1
LOGS OF BACKHOE TEST PITS
(Figure 2 shows pit locations)

Depth (m)	Description
	TP26 (upper slope)
0 - 0.08	Sandy loam, brown, abundant fine grass roots, gradational base.
0.08 - 0.20	Sandy loam, light brown, roots, scattered white quartzite pebbles & a broken subrounded red jasper pebble 60 mm across near base of unit.
0.20 - 0.58	Sandy clay, grey, orange mottles, scattered roots, charcoal fragments, sharp base.
0.58 - 1.5+	Sandstone, clayey, coarse to very coarse, granular, soft, light grey, red & orange mottles, red iron stained layer at top, rare pebbles & thick roots, weathered bedrock.
	TP27 (midslope)
0 - 0.05	Sandy loam, brown, roots.
0.05 - 0.28	Sandy loam, light brown, roots, scattered pebbles.
0.28 - 0.85	Clay, grey, orange mottles, scattered roots.
0.85 - 0.9+	Sandstone, clayey, coarse to very coarse, grey, orange mottles, white clay matrix, weathered bedrock.
	TP28 (midslope)
0 - 0.10	Sandy loam, brown, abundant fine roots.
0.10 - 0.24	Sandy loam, light brown, abundant fine roots.
0.24 - 0.40	Sand, fine, clayey, light grey, friable, charcoal fragments, scattered fine roots, scattered pebbles, eg. white quartzite 40 mm, subrounded red jasper 30 mm, a cobble 140 mm.
0.40 - 0.75+	Clay, sandy, grey, orange mottles, scattered pebbles, weathered bedrock.

TP29 (lower slope)

0 - 0.05	Sandy loam, brown, fine grass roots, gradational base.
0.05 - 0.12	Sandy loam, light brown, grass roots, sharp base.
0.12 - 0.50	Sand, fine to medium, clayey, grey, orange mottles, scattered woody roots; scattered pebbles in top part of unit, from 0.14 to 0.17 m depth, of eg.off-white subrounded quartzite 20 mm; sharp base.
0.50 - 0.60+	Sandstone, medium to coarse, granular, quartz-lithic, grey, orange iron staining in top 25 mm, weathered bedrock.

TP30 (midslope)

0 - 0.08	Sandy loam, brown, roots, damp.
0.08 - 0.18	Sandy clay loam, brown, orange & red iron stone fragments & mottles, damp, rare rounded pebbles.
0.18 - 0.38	Clay, brown, red & orange mottles, sticky, few roots.
0.38 - 0.90	Clay, sandy, grey, red mottles, rare pebbles, woody roots, damp.
0.90 - 1.18+	Sandstone, clayey, soft, coarse to very coarse, pebbly, quartz-lithic, grey, orange mottles, weathered bedrock.

TP31 (in broad gully)

0 - 0.14	Sandy loam, brown, roots, clay content increases with depth, damp, gradational base.
0.14 - 0.44	Loam, light brown becoming lighter coloured with depth, roots, damp, sharp base.
0.44 - 1.7	Clay, grey becoming light grey with depth, red & orange mottles, damp & sticky, scattered pebbles; light grey clayey sandstone with orange iron staining at base of pit - weathered bedrock.

TP33 (midslope)

0 - 0.09	Sandy loam, brown, roots.
0.09 - 0.38	Sandy loam, light brown, faint orange mottles, few roots, pebbles & cobbles concentrated in lower 0.07 m of unit, sharp base.
0.38 - 0.60	Clay, sandy, brown, orange mottles, damp, stiff, gradational base.
0.60 - 1.05	Clay, sandy, grey, orange mottles.
1.05 - 1.10+	Sandstone, grey, orange iron staining, scattered pebbles, weathered bedrock.

TP 34 (ridge top)

0 - 0.10	Sandy loam, brown, abundant roots.
0.10 - 0.27	Sandy loam, light brown, common roots, scattered pebbles to 60 mm.
0.27 - 0.60	Clay, sandy, grey, orange & red mottles, scattered pebbles, rare small charcoal fragments, gradational base.
0.60 - 0.93+	Sandstone, clayey, grey, orange mottles, weathered bedrock.

TP36 (lower slope)

0 - 0.18	Sandy loam, brown, roots, rare pebbles.
0.18 - 0.31	Sandy loam, light brown, roots, common pebbles.
0.31 - 0.67	Clay, sandy, grey, orange mottles.
0.67 - 0.68+	Sandstone, grey, orange mottles, weathered bedrock.

TP40 (lower slope)

0 - 0.14	Sandy loam, brown, roots.
0.14 - 0.25	Charcoal, red-brown ashy loam, roots.
0.25 - 0.76	Sandy loam, light brown, friable, common roots, scattered red & orange mottles & pebbles common below 0.5 m depth, a flat discoid brown cobble of very fine grained ironstained indurated sandstone 90 mm across is oriented subvertically in profile at 0.45 m depth.

0.76 - 1.00	Clay, sandy, brown, orange mottles.
1.00 - 1.04+	Sandstone, grey, weathered bedrock.

TP41 (midslope)

0 - 0.17	Sandy loam, brown, roots, gradational base.
0.17 - 0.28	Sandy loam, light brown, pebbles at base, sharp base.
0.28 - 0.80	Clay, sandy, brown, orange mottles, gradational base.
0.80 - 0.90	Clay, grey, orange mottles.
0.90+	Sandstone, very clayey, grey, orange mottles, stiff, weathered bedrock.

TP42 (midslope)

0 - 0.17	Sandy loam, brown, abundant roots.
0.17 - 0.30	Sandy loam, light brown, roots, pebbles at base.
0.30 - 1.00	Clay, sandy, brown, orange mottles.
1.00+	Sandstone, fine, grey, orange mottles, weathered bedrock.

TP43 (midslope)

0 - 0.17	Sandy loam, brown, roots, sharp base.
0.17 - 0.35	Sandy loam, light brown, rare pebbles, rare iron stained sandy clumps, gradational base.
0.35 - 0.50	Pebbles & cobbles in light grey-brown sandy loam matrix, clast-supported, friable matrix; clasts are rounded & subrounded, some have broken faces, clasts include red & brown jasper, black, white & pink quartzites, white quartz-feldspar porphyry, a brown clast 100 mm across; scattered roots, sharp base.
0.50 - 0.70	Clay, sandy - medium to coarse, grey, orange mottles, scattered pebbles, roots, weathered sandstone.
0.70 - 1.00+	Sandstone, grey, orange & red mottles, some thick roots, weathered bedrock.

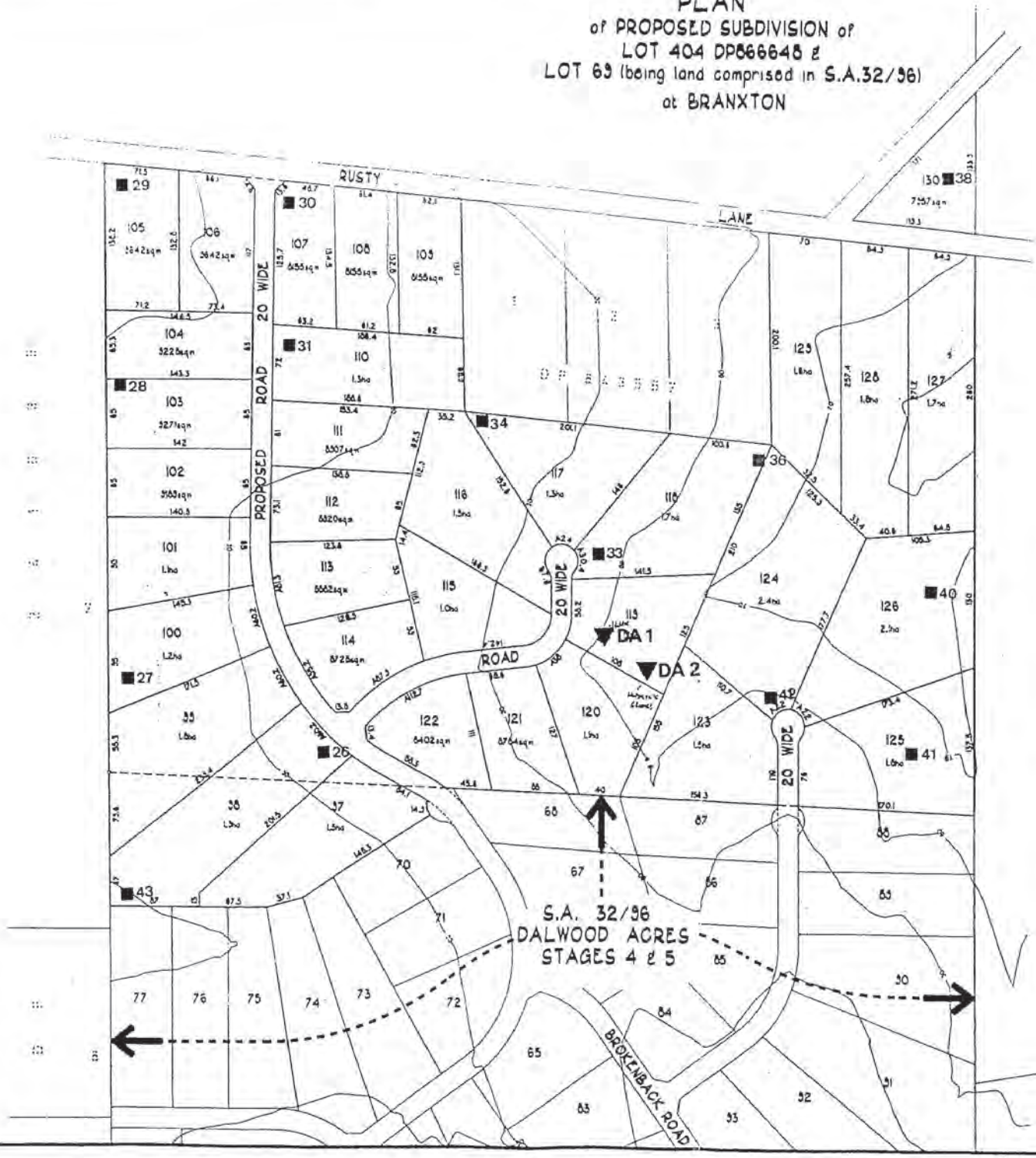
APPENDIX 2: FIGURES

MARY DALLAS BA(HONS) SYD UNI•MAACA•31 WATERVIEW ST. BALMAIN NSW 2041•TEL (02) 9818 3287•FAX (02) 9818 4574

FIGURE 1 : STUDY LOCALITY
Greta 1:25,000

MARY DALLAS BA(HONS) SYD UNI•MAACA•31 WATERVIEW ST. BALMAIN NSW 2041•TEL (02) 9818 3287•FAX (02) 9818 4574

PLAN
of PROPOSED SUBDIVISION of
LOT 404 DP866648 &
LOT 69 (being land comprised in S.A.32/96)
at BRANXTON

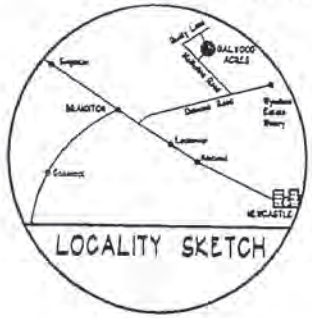


PCB
PULVER COOPER & BLACKLEY

TOWNPLANNERS CIVIL ENGINEERS
SURVEYORS PROJECT MANAGERS
(049)29 2677

FIGURE 2 : SUBDIVISION PLAN

▼ Aboriginal Site Locations
■ Backhoe Test Pits



LOCALITY SKETCH

TOTAL NUMBER of PROPOSED LOTS = 34

ALL DIMENSIONS, AREAS, LOT NUMBERS etc
SUBJECT TO REGISTRATION OF DEPOSITED PLANS

INSTRUCTION NUMBER: 33/135
DATUM: Australian Height Datum
CONTOUR INTERVAL: 5m
DATE: JULY 1997
SHEET 1 OF 1 SHEETS

40 20 0 40 80 120
Original Size 1:2000

APPENDIX 3 : PLATES

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1. DA 1 Scarred Tree

2. DA 2 Axe Grinding Grooves

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3. DA 2 : view over sandstone exposure

4. View downstrean of upper reach tributary in southern portion of study area

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5. View southwest from northwestern corner of site [TP29]

6. Regenerating woodland in southwestern portion of site

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7. View north over yards and TP 26 at southern boundary of site

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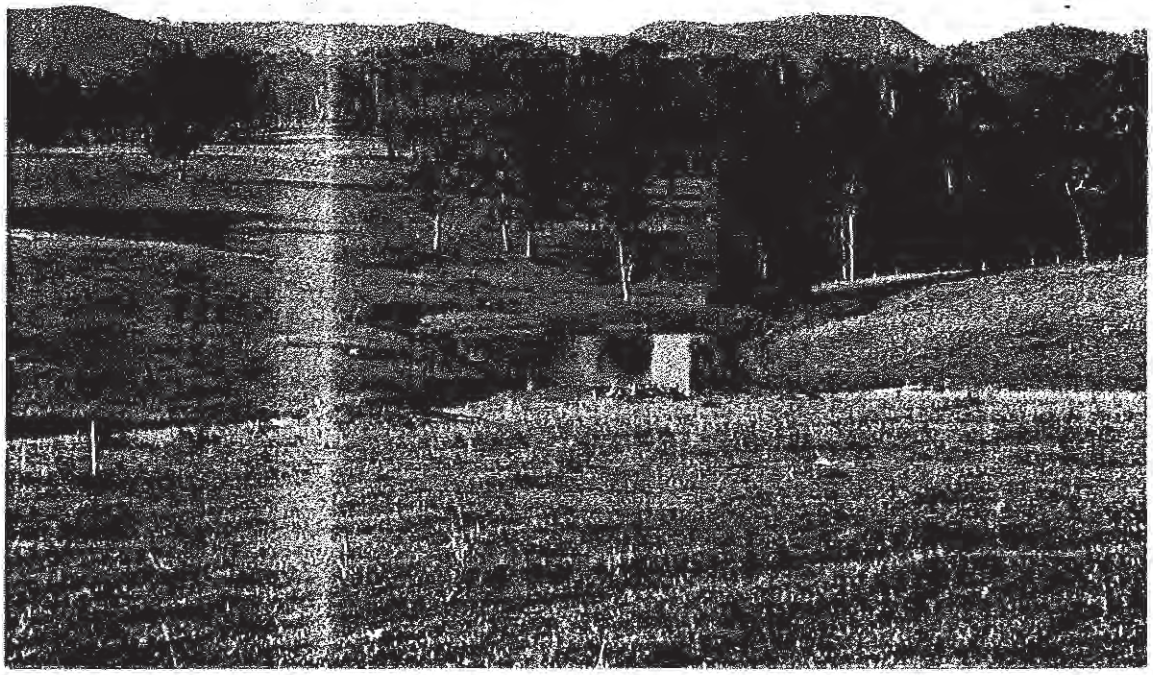

8. View to northeast from TP42 showing foreground ploughing and largest farm dam on the property

9. Sandstone outcrop showing dropstone near axe-grinding groove

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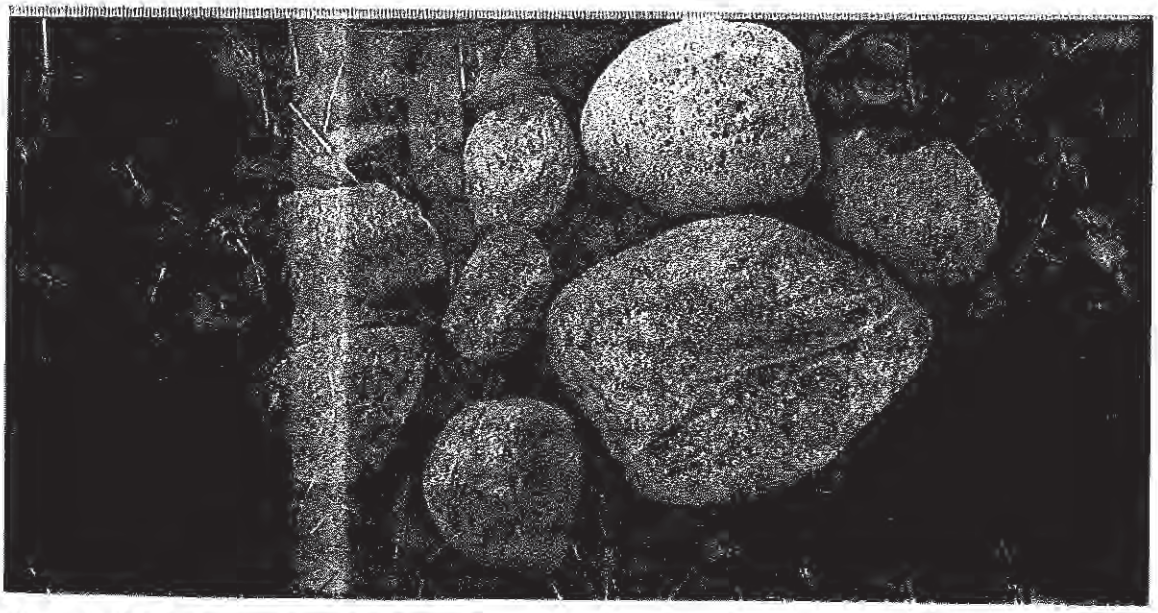
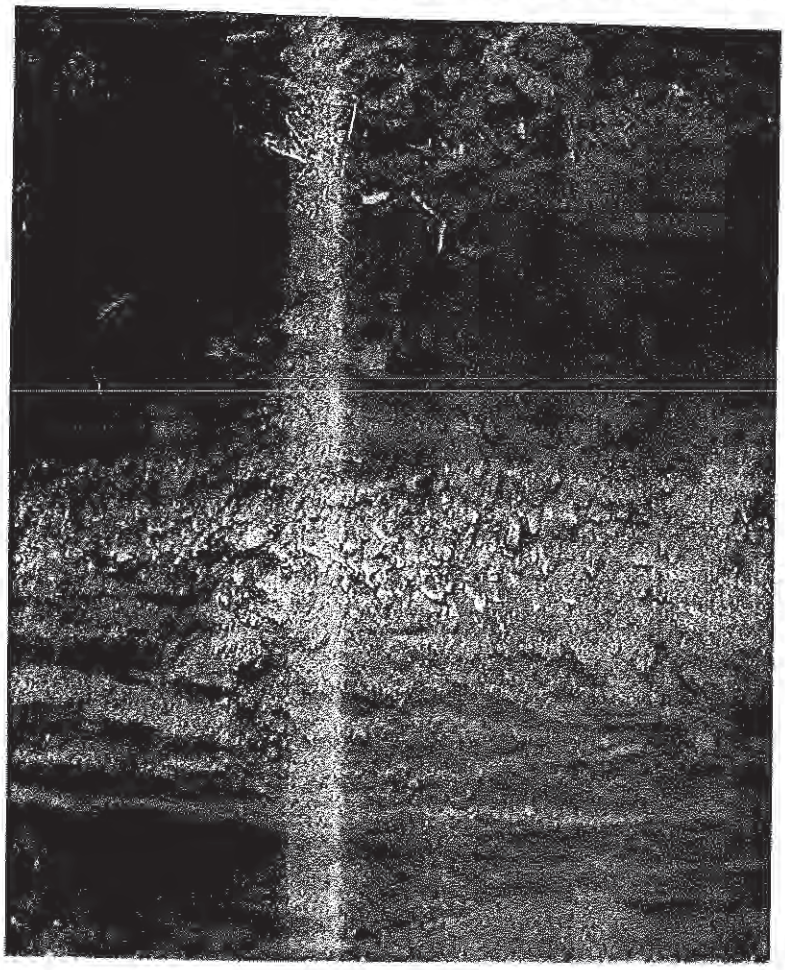


10. Pebbles and cobbles from TP43, A2 horizon [Large cast is 100m



11. Soil Profile in TP 43 showing gravel layer in A2 Horizon

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12. Soil Profile in TP26 showing sandy loam topsoil & orange mottling in subsoil.

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APPENDIX 4 : NPWS STANDARD SITE RECORDING FORMS

MARY DALLAS BA(HONS) SYD UNI•MAACA•31 WATERVIEW ST. BALMAIN NSW 2041•TEL (02) 9818 3287•FAX (02) 9818 4574

[✓] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

NPWS Code

1:250,000 map sheet: NEWCASTLE

AMG Grid reference (Full reference - please include leading digits)

250K 250K

3 4 8 2 5 0 mE (25K) 6 3 8 7 5 0 0 mN (5/6 25K)

Scale of map used for grid reference (Please use largest scale available) [✓] 25K, 50K (preferred) [ ] 100K [ ] 250K

(1:25K) 50K, 100K map name: Greta

HEAD OFFICE USE ONLY:

NPWS Site no:

Site types:

Accessioned by: Date:

Data entered by: Date:

Owner/Manager:

Address:

Site name: DA 1 Locality/property name: Dalwood Acres, Braxton

NPWS District: Muswellbrook Region: Hunter

Reason for investigation:

Impact Assessment.

Portion no:

Parish:

Photos taken?

How many attached? see Accompanying Report.

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff) (Draw diagram on separate sheet)

see attached Map. Access via Rushy Lane.

Other sites in locality? Yes. Site Types include Axegrinding grooves.

Are sites in NPWS Register? Yes.

Have artefacts been removed from site? No. When?

By whom? Deposited where?

Is site important to local Aborigines? Yes.

Give contact(s) name(s) + address(es) Rick Griffiths
Mindaribba LALC

Contacted for this recording? Yes.

(Attach additional information separately) If not, why not?

Verbal/written reference sources (including full title of accompanying report)

Dallas & Kerr 1997 Archaeological & Geomorphological Assessment of Proposed Subdivision of Rural Land at Dalwood Acres, Stages 4 & 5, Hunter Valley. Appendix A in Barton 1997.

NPWS Report Catalogue #

Checklist surface visibility, damage/disturbance/ threat to site

Condition of site: Fair, slight insect infestation

Recommendations for management & protection (attach separate sheet if necessary)

Reserve. see Acc. Report.

Site recorded by: M Dallas.

Address/institution: 31 Waterview St
Balmoral NSW 2084

Date: 1.11.97

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1 Land form a. beach / hill slope / ridge top, etc:

b. site aspect: Open c. slope: 30°

d mark on diagram provided *or* on your own sketch the position of the site:

e. Describe briefly: Site adjacent ephemeral stream in upper reach / below ridge crest.

f Local rock type: Braxton Formation g Land use/effect: ploughing / clearance.

2 Distance from drinking water: 40 - 50 m Source: ephemeral stream

3 Resource Zone associated with site (estuarine, riverine, forest etc): forest.

4 Vegetation cleared pasture

5 Edible plants noted: none

6 Faunal resources (include shellfish): none

7 Other exploitable resources (river pebbles, ochre, etc):

Site type

Scarred Tree.

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth

QUARRIES rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, middens), mythological sites, rock holes, engraved groove channels, contact sites (massacres, massacres, cemeteries) as appropriate

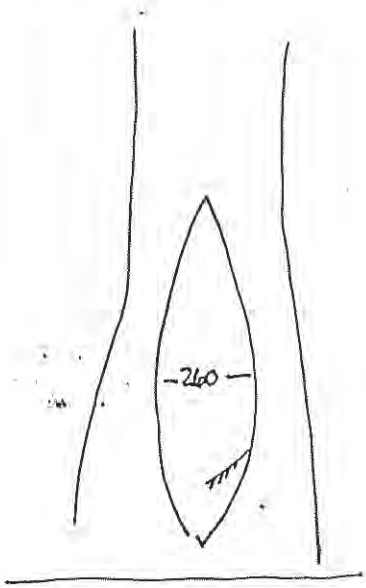
DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

Ironbark - 20m tall, 2370cm girth at scar

Scar: 1435 x 260 x 25cm on north side of tree.

axe marks near base / some insect infestation of exposed wood.



Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

[V] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 3/88

NPWS Code

1:250,000 map sheet: NEWCASTLE.

AMG Grid reference (Full reference - please include leading digits)

250K: 3 4 8 2 7 0 mE (25K) — 250K: 6 3 8 7 4 7 0 mN (5/6 | 25K)

Scale of map used for grid reference (Please use largest scale available): [V] 25K, 50K (preferred) [ ] 100K [ ] 250K

(1:25K), 50K, 100K map name: Greta

HEAD OFFICE USE ONLY:

NPWS Site no:

Site types:

Accessioned by: Date:

Data entered by: Date:

Owner/Manager:

Address:

Site name: DA 2

Locality/property name: Dalwood Acres, Branxton

NPWS District: Muswellbrook

Region: Hunter

Reason for investigation:

Impact Assessment.

Portion no:

Parish:

Photos taken?

How many attached? see accomp. report.

How to get to the site (refer to permanent features, give best approach to site eg from above, below, along cliff) (Draw diagram on separate sheet.)

see attached Map. - Access via Rusty Lane.

Other sites in locality? Yes. Site Types include: Scarred Trees.

Are sites in NPWS Register?

Have artefacts been removed from site? No When?

By whom? Deposited where?

Is site important to local Aborigines? Yes.

Give contact(s) name(s) + address(es) Rich Griffiths. Mindaribba LALC

Contacted for this recording? Yes.

(Attach additional information separately) If not, why not?

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue #

see Dallas & Kerr 1997 Archaeological & Geomorphological Assessment of Proposed Subdivision of Rural Land at Dalwood Acres, Hunter Valley Appendix 4 to Barton 1997

Checklist: surface visibility, damage/disturbance/ threat to site

Condition of site: Good - some vehicle disturbance to Sandstone & some exfoliation. Grooves are clear

Recommendations for management & protection (attach separate sheet if necessary)

Preservation see accompanying report.

Site recorded by: M. Dallas

Address/institution: 31 Waterview St Balmain NSW 2041

Date: 1.11.97

SITE POSITION & ENVIRONMENT | OFFICE USE ONLY: NPWS site no:

1. Land form a. beach / hill slope / ridge top, etc: b. site aspect: open c. slope: 30°

d. mark on diagram provided *or* on your own sketch the position of the site:

e. Describe briefly: exposed sandstone bedrock in creek in upper reaches.

f. Local rock type: Brauxiem Formation Sandstone g. Land use/effect: cleared pasture

2. Distance from drinking water: 0 Source: rock pools in ephemeral creek.

3. Resource Zone associated with site (estuarine, riverine, forest etc): Forest.

4. Vegetation: pasture grass / occasional bracken.

5. Edible plants noted: none

6. Faunal resources (include shellfish): none

7. Other exploitable resources (river pebbles, ochre, etc): none

Site type: Axe Grinding Grooves.

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents: shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

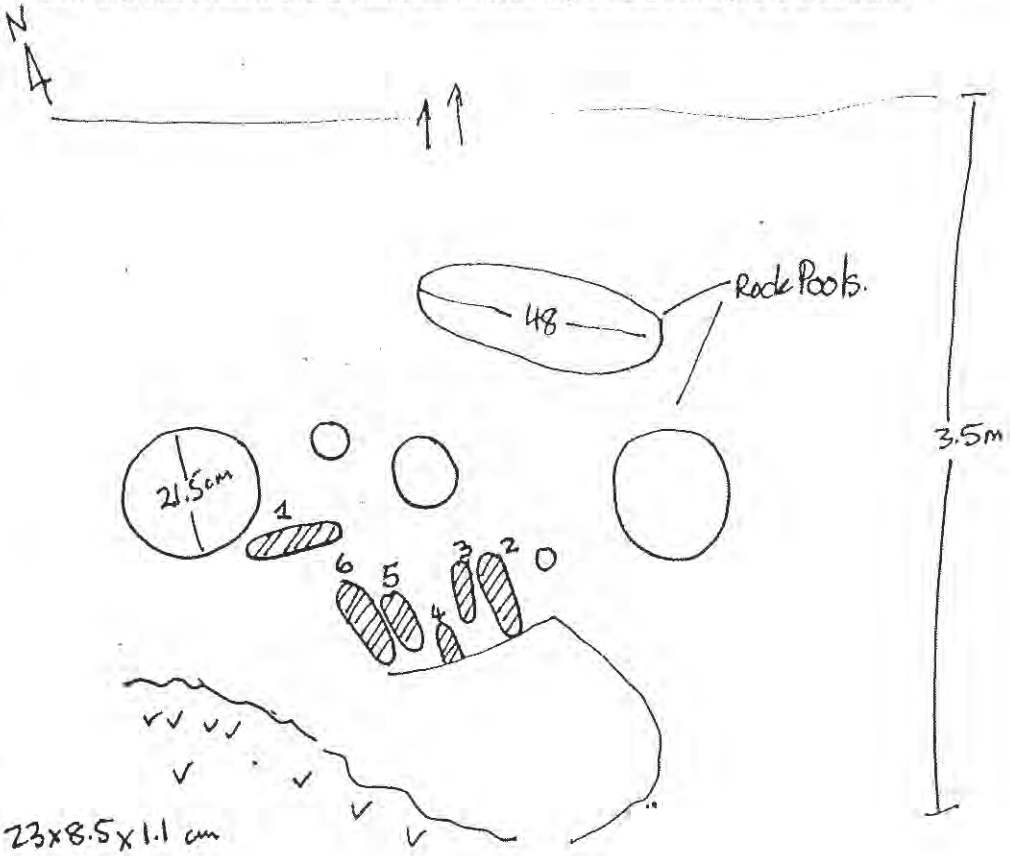
TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.



1. 23 x 8.5 x 1.1 cm
2. 36 x 9 x 1.1
3. 20 x 6 x 0.8
4. 12.5? x 5 x 0.5
5. 25 x 6 x 0.5
6. 26 x 7.5 x 0.8

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.