

The preferred option is based on the most likely long term need for three new primary schools. These are shown in Jacka, Bonner and Taylor. Existing schools in Ngunnawal and Nicholls (Gold Creek) and proposed schools in Amaroo provide good accessibility for children in Casey and Moncrieff. One new high school is proposed, co-located with the primary school in Taylor. Co-location of primary schools and high schools is favoured by the Department of Education and Community Services. A site for a possible secondary college will be reserved adjacent to the Mirrabei Group Centre in Moncrieff.

Depending on density, occupancy rates and future policy for school provision, an additional school may need to be provided in Forde. If not required for a government school, the site may be available for a private school. A reserve site is included in the Structure Plan in Forde.

The Structure Plan meets the four main tests in relation to the provision of school sites:

- it can respond to a variety of future growth rates and sequence patterns (ie. it is robust);
- it maximises accessibility for children across the whole area;
- it helps create central places within suburbs; and
- it supports the possibility of combined high school, primary school campus development and associated district playing fields.

In addition, it provides an opportunity for the siting of an independent school in North Gungahlin.

9.2.4 Conservation of Natural Resources

There is a growing awareness of environmental issues and better understanding of ecological and conservation principles. The current planning processes for new and established areas in the ACT recognise the importance of the environment, with land use decisions dependent on the completion of detailed studies, thus ensuring careful consideration of ways to protect and/or incorporate significant environmental assets within the urban framework. These practices have been adopted in the development of the North Gungahlin Structure Plan.

Successive ACT Government's have demonstrated a commitment to conservation of natural resources as an important part of the planning process. 740 ha of land previously zoned for urban use (including residential, commercial and community facility purposes) throughout Canberra has been incorporated into Canberra Nature Park since 1988 (**Table 9.1**).

In addition to this land previously zoned future review for urban use, the ACT Government announced in 2000 that the Jerrabomberra Valley (Broadacre Land Use Policy) would not be developed as the next town in the ACT due to a number of constraints. These included, ANEF noise contours, defence and quarry clearance zones, 100 year flood levels and ecological requirements. This decision creates the opportunity to conserve significant areas of woodland and grassland.

In overall ACT terms of potential residential development this means that an area of approximately 30,000 homes (equivalent of Weston Creek) is no longer available for that purpose.

Table 9.1: Urban Areas placed into reserve/urban open space or proposed to be in the future.

Existing	Location	Area (ha)	Community
	Mulligans Flat/ Gungaderra/ Mulanggarri	300	YBRG
	Gungaderra	117	NTG
	Mulanggarri	124	NTG
	Dunlop	31	NTG
	North Watson	19	Woodland
	Crace	117	NTG
	Conder	13	YBRG
	Forde	19	YBRG
	Total	740	
Proposed (Subject to Outcomes of Statutory Processes)	South Bruce	8	Woodland
	Lawson	100	NTG
	O'Malley East	62	YBRG
	Gooroo/East Gungahlin	300	YBRG
	Total	470	
Other Areas (Broadacre)	Jerrabomberra	1350	NTG & YBRG
'X' Overlay	Lake Ginninderra	14	Open Space
	Total	1364	
	Overall Total	2574	

Note: Proposed areas are only approximate.

YBRG = Yellow Box/Red Gum Grassy Woodland

NTG = Natural Temperate Grassland

'X' Overlay = Lake Ginninderra site was not developed for residential purposes due to a Government commitment to not develop areas of urban open space

In order to provide for balanced planning outcomes, it is not feasible to preserve all ecological elements. However, the ACT planning process allows flexibility in its approach to accommodate conservation imperatives outlined in Action Plans prepared under the *Nature Conservation Act (1980)*. These plans indicate that some natural features are not proposed to be protected in full but elements could be considered for incorporation into the urban fabric as part of the detailed planning process.

This principle is implemented in the planning for the North Gungahlin Structure Plan where ecological assets, including the Horse Park Wetland, some remnant patches of Yellow Box/Red Gum woodland such as the eucalypt arcade in Casey and some areas of Natural Temperate Grassland will be maintained and protected within open space and parks. These outcomes demonstrate that protection of the environment plays an important role in planning in the ACT and will be continued through the implementation of the North Gungahlin Structure Plan and subsequent stages of the detailed planning process for this area.

Ecological issues also play a major role in the planning of North Gungahlin. Since the initial planning, detailed ecological studies of Gungahlin together with an expanding knowledge base of the ecological resources of the ACT has revealed many details of the ecology of the North

Gungahlin area which were beyond the scope of some early "broad-brush" studies. The new information has resulted in significant changes to the planning of North Gungahlin, including the expansion of the Mulligans Flat Nature Reserve beyond its original planned boundaries.

One of the reasons for reviewing the North Gungahlin area was the need to re-address the planning of Gungahlin in response to these changes. Specifically, it reviewed reports relevant to the study area, including:

- Ecological studies of Gungahlin;
- ACT wide studies with relevance to Gungahlin;
- Other area based studies;
- The Gungahlin Environmental Impact Assessment; and
- Action Plans for threatened species and ecological communities prepared under the *Nature Conservation Act 1980*.

At the same time, it is important to determine the presence of any other emerging ecological issues which were not considered in the earlier planning which may present new potential constraints on development. Similarly, whether the earlier ecological constraints can still be justified in the light of more detailed information.

A key determinant of the direction of environmental planning in recent years is the wide acceptance of the principles of sustainable development, and its key elements such as inter-generational equity, protection of biodiversity and the precautionary principle. In determining open space and stormwater channels the principles of Sustainable Urban Stormwater Management are to be adopted.

The prime objective of the planning of Gungahlin from a sustainability perspective is to create a town which will sustain a high level of environmental quality for the present and the future. Sustainability principles support appropriate development and are not a prescription for protecting every element of ecological value. Balanced against the need to protect ecological values in Gungahlin should be the recognition that the more that development is constrained in Gungahlin, the greater the pressures will be for urban development in alternative locations.

(a) Woodland

Yellow Box/Red Gum Grassy Woodland

As mentioned previously, the most significant of the woodland communities in the ACT, the Yellow Box/Red Gum (YBRG) Grassy Woodland community occurs throughout the ACT. Declaration of this ecological community as endangered in May 1997 emphasised the significance of the woodland community locally and its role in the provision of habitat for a variety of common and vulnerable animal and bird species. Very high conservation value woodland areas identified by Action Plan No. 10 are located in the Mulligans Flat Nature Reserve and Gooroo to the east, and Kinlyside to the west, of North Gungahlin. Smaller remnant patches (totalling 147ha) of high conservation value woodland have been identified in areas proposed for future urban development in North Gungahlin (see **Figure 12**).

The Gungahlin Final Environmental Impact Statement (EIS) 1989 identified the Mulligans Flat area as a site of natural significance, the statement of reasons citing its dense vegetation and presence of some uncommon species. It further recognised the area as being of regional significance from an ecological viewpoint, proposing that its suitability for urban development be foregone in favour of its use for ecological and recreational purposes. The total area of the Mulligans Flat Reserve to be maintained was approximately 140 ha.

Variation to the Territory Plan No. 15 Mulligans Flat 1994 amended the land use polices contained with the Territory Plan for north-east Gungahlin, enlarging the Mulligans Flat Reserve to over 300 ha in size, to conserve ecologically significant communities including the YBRG Grassy Woodland. This will ensure the conservation of this community and enhance the representation of very high value YBRG Grassy Woodland community in the Mulligans Flat Nature Reserve. The total area of YBRG woodland within the Mulligans Flat Nature Reserve is now approximately 362 ha. Following the review of Action Plan 10 and additional planning studies in the Gooroo and Kinlyside areas, additional YBRG woodland areas may be retained in reserves in Gungahlin.

The Gungahlin EIS (1989) identified the presence of a number of tree species and associations, including the YBRG as the most widespread, but gave no indication as to their ecological significance. In identifying major constraints to future urban development, ecological issues were considered within the context of the National Capital Open Space System (NCOSS), which includes the prominent hills and ridges enclosing Gungahlin along the ACT border to the north with major ridgelines to the south and the Ginninderra creek corridor. The EIS considered that neighbourhood landscape design should recognise significant landscape features and where appropriate should retain and reinforce their specific characteristics. An arcade of existing mature eucalypts near Gold Creek (Casey), Horse Park Homestead and environs and Mulligans Flat are identified within the North Gungahlin area.

Within the proposed future urban area, the Gungahlin EIS (1989) does not appear to have given substantial consideration to the area's ecological values or to retention of remnant woodland communities or individual trees, apart from any co-incidence with the NCOSS area and proposed modified creek systems. Instead, it suggests landscape diversity be achieved by revegetating hill areas through natural regeneration and forward tree planting, and the use of creative conservation and ecologically based planting schemes to increase wildlife habitat.

Adjoining the eastern boundary of Forde, a 28.4 ha area of very high and high conservation value YBRG woodland is identified in Action Plan No.10, 19 ha of this woodland has now been incorporated into Mulligans Flat Nature Reserve under Variation to the Territory Plan No. 182. The North Gungahlin Structure Plan takes this into account by modifying the structure of the proposed future suburb of Forde and incorporates planning principles and policies to address the buffer area between the future urban area of Forde and the Nature Reserve. The remaining woodland in Forde will not be retained as a woodland community, however high value individual trees and stands of trees capable of being incorporated into the urban fabric will be retained in open space.

Several remnant patches of high and moderate conservation value YBRG grassy woodland are located within the North Gungahlin area. The distribution of these remnant patches within the Structure Plan, and the proposed future management options for these areas within the urban fabric are summarised below in **Tables 9.3 and 9.3**

Table 9.2 Distribution of Yellow Box/Red Gum Grassy Woodland – North Gungahlin Structure Plan

North Gungahlin Suburbs	Area of Remnant YBRG by suburb (ha)	Proposed result for remaining woodland	
		Included within urban open space (ha)	May be incorporated into urban fabric subject to later & more detailed planning processes (ha)
Forde*	43.3	3.3	40
Bonner	60.1	19.2	40.9
Jacka	14.6	2.5	12.1
Moncrieff	10	3.2	6.8
Casey	19	18	1
TOTAL	147 100%	46.2 31%	100.8** 69%

Note:

*An additional 19ha area recently removed from Forde and incorporated into the Mulligans Flat Nature Reserve under Variation No. 182 to the Territory Plan, August 2002.

** Individual trees and stands of trees will be incorporated into the urban area as appropriate.

Table 9.3 Distribution of Yellow Box/Red Gum Grassy Woodland – Gungahlin District

Gungahlin District Areas (see Fig11)	Total Area of YBRG woodland (ha)	Future management options for YBRG community
Mulligans Flat Nature Reserve	362 ha	362 ha retained in Reserve (includes 19ha from DVP182)
Gooroo	648 ha	570ha subject to assessment as part of 2002 review of Action Plan 10 and planning studies
Kiulyside	251	251ha subject to assessment as part of 2002 review of Action Plan 10 and planning studies
North Gungahlin	147	100.8ha incorporated into urban fabric. 46.2ha included within urban open space
TOTAL	1408 ha (100%)	

ACT SCALE

Total Area YBRGGW = 7888 ha (100%)

North Gungahlin area affected = 100.8 ha (1.3%)

Note : Areas of YBRG stated, are polygon areas ie areas around individual trees or groups. The density of trees within these polygons could vary.

Retention of remnants as viable ecological communities within a matrix of urban development is unlikely as they are small, fragmented and subject to competing land use pressures. It is not proposed to retain remnant patches as viable examples of their vegetation type within the areas of urban development. Later more detailed planning will look at options for incorporating the trees into the urban fabric where possible. Action Plan 10 states that some of these areas may be included in urban parks, roadside reserves or as part of the landscape setting for community purposes. Opportunities to retain and enhance groups of trees may also occur where areas of open space associated with natural creek corridors and internal ridgelines between the suburbs proposed

by the Structure Plan co-incide with the location of these remnant areas. Individual trees identified as having ecological value by surveys for the detailed suburb planning will be protected to the extent possible by mechanisms such as incorporation within the urban fabric. These trees may be eligible for protection under the ACT's tree protection legislation when development occurs and leases are issued.

Action Plan No. 10 acknowledges that while conservation of the YBRG grassy woodland community as a viable and well represented ecological community in the ACT is its objective, protective actions will be selectively applied in the context of Canberra's future development needs and protection measures across the ACT. The Action Plan indicated that there were no specific areas of YBRG grassy woodland in the North Gungahlin area that were so critical to the survival of the community that they would be an absolute constraint on other land uses. It should be recognised that the extent and quality of both woodlands in general and the YBRG woodland within the Mulligans Flat Nature Reserve and Gooroo area are significantly greater than elsewhere in the North Gungahlin area

Additional planning studies are being undertaken in the Kinlyside and Gooroo areas (west and east respectively of North Gungahlin) to assess the conservation value of the remaining areas of YBRG Grassy Woodland communities. These areas are identified in Action Plan No. 10 as having the greatest potential in this area for conservation, in particular, the Gooroo area which functions as an important ecological link between Mulligans Flat Reserve and the Mt Majura Reserve.

Current studies being undertaken jointly with Environment ACT in East Gungahlin are considering the presence of high and very high conservation value YBRG grassy woodland communities, large areas of which are covered by the Residential Land Use Policies of the Territory Plan. The work is analysing possible structure plan options that take account of the ecological constraints identified on future urban development. The option used as the basis for a future East Gungahlin Structure Plan will include retention of significant areas of YBRG Grassy Woodland and grassland in hills, ridges and buffer areas and retention of a continuous wildlife corridor along the eastern edge of Gungahlin between Mulligans Flat and Mt Majura, consistent with the objectives of Action Plan No. 10.

On a regional scale, the protection of the high and very high conservation value woodlands at Mulligans Flat and Gooroo will contribute to the wider regional approach to the conservation of the community within NSW. This regional approach is facilitated by a framework of strategies and actions contained in the 1998 ACT and Sub Region Planning Strategy for managing natural and cultural resources.

Other woodlands

Both botanical and ecological values are also attributed to other woodland communities, primarily for wildlife habitat and wildlife corridors. North Gungahlin contains areas of regenerating woodland which are of potentially high conservation value in the context of the ecological resources of the ACT and the local area. The proposed urban development will impact on these other woodland communities.

The Gungahlin EIS (1989) did not substantially consider the retention of trees within the proposed urban area with the exception of landscape value in areas coincident with urban open space and the NCOSS. The Structure Plan limits development on the higher slopes, and considers the presence of woodlands in the design and location of the outer edge of urban development.

The scattered nature of small, fragmented woodland areas across the lower slopes of the study area makes their integration and/or conservation as isolated communities within the urban fabric virtually impossible. However, it is anticipated that there will be trees that have individual value

independent of their role in a forest or woodland ecosystem ie trees with particularly good nesting hollows. A tree survey conducted during the detailed planning stage for each suburb will identify trees with high ecological values. Further design work at the detailed planning stage will then offer feasible retention and protection options for these trees within the urban area, such as incorporation in small parks, village centres and road reserves. These trees also may be eligible for protection under the ACT's tree protection legislation when development occurs and leases are issued.

(b) Forestry Plantation

The plantation area to the north of the urban development area of North Gungahlin was established for the production and supply of fuel wood for the ACT. The eucalypt plantings have been in place for over 20 years, during which time they have matured sufficiently to integrate with the existing native woodland vegetation in that location, to form a modified woodland community, to which some ecological and landscape value can now be attributed.

The implementation of the Structure Plan will not have any impact on this plantation. Future harvesting for fuel wood is unlikely to occur.

The decision not to harvest the plantation to provide a supply of fuel wood to the ACT is also consistent with current initiatives aimed at the reduction of the use of fuel wood appliances, to prevent deterioration in air quality over the ACT.

The Structure Plan does not propose that areas of forward tree plantation located within Jacka and Taylor will be retained within the urban areas. The forward tree planting program intends the use of these plantings for possible future landscape purposes.

(c) Natural Temperate Grasslands

Due to a range of pastoral uses, very little remains of the native grassland communities once thought to be present in North Gungahlin. Declaration of the Natural Temperate Grassland as an endangered ecological community in April 1996 recognised the decline in the distribution of the grassland community and its changing composition as a result of land use history. Action Plan No. 1 identifies several areas containing Natural Temperate Grassland within the Gungahlin District, some of which are now protected in reserves to the south of the North Gungahlin study area (Mulanggarri, Gungahlin and Crace Nature Reserves). Within North Gungahlin, Grassland Action Plan (GAP) Site No.1, of approximately 32 ha in size, is identified to the south east of the Horse Park Homestead and is assessed as having moderate to low botanical significance (see **Figure 11**).

The Gungahlin EIS (1989) noted that grasslands dominated valley floors, covering just over half the area (on a total district basis) and comprised primarily cultivated or improved pasture. It also stated that the distribution of native grass species such as *Themeda*, *Danthonia*, *Stipa* and *Agrostis* spp. were severely limited. It did not note any grassland sites of significance in the North Gungahlin area, or consider grasslands to have significant conservation value in its environmental evaluation of the proposed future development.

Development of the proposed future suburb of Bonner will impact on Grassland Action Plan Site No.1. The Action Plan has assigned a moderate botanical significance rating to the 10.3 ha Wet *Themeda* component of this grassland, and a low conservation value to the remaining 21.8 ha *Danthonia* grassland. The Structure Plan does not propose to retain the entire grassland area although parts may feature as landscape elements within the urban fabric such as within areas of open space associated with natural drainage lines, internal ridgelines and/or local parks. Further consideration of these options will occur during later detailed planning stages.

Parts of the grasslands are habitat for an uncommon plant species, the Emu Foot *Cullen tenax*. The species has also been recorded at a site on the eastern side of Gundaroo Rd in the proposed urban areas of Forde (see **Figure 11**). Further consideration of this species in these two locations will be required in conjunction with Environment ACT at the detailed planning stage to determine future management options.

(d) Wetlands

The Horse Park Wetland is identified as the most significant wetland within the North Gungahlin area, and in the Gungahlin District (**Figure 11**). The significance of its cultural and ecological values is demonstrated by its listing as part of the Horse Park precinct on the Register of the National Estate, inclusion in "A Directory of Important Wetlands in Australia", classification by the National Trust of Australia (ACT) and nomination for listing on the ACT Heritage Register.

The Gungahlin EIS (1989) noted the occurrence of a sedgeland and associated aquatic vegetation species at Horse Park and the creation of a temporary wetland habitat caused by inundation after heavy rain in this area. The EIS identified the Horse Park Sedgeland as a site of natural significance and the Horse Park homestead and environs as an area of particular landscape significance to retain and reinforce in the neighbourhood landscape design. The evaluation of the site indicated that it was compatible with the urban development, though potential for future use was sensitive and conservation is the recommended action. The EIS does not acknowledge the value of the wetlands for Latham's Snipe habitat or Aboriginal heritage.

The *Directory of Important Wetlands in Australia* noted the potential threat to the Horse Park wetlands from suburban development, and that it needed to be carefully managed to minimise impacts on the hydrology of the site. Potential impacts on the population of Latham's Snipe by domestic pets was also noted.

The Structure Plan proposes to protect the wetland by including it within a substantial area of Urban Open Space (generally incorporating the curtilage boundaries identified by the Register of the National Estate listing for the wetland) which will be subject to specific planning policies and management practices. At the detailed planning stage, further consideration of sensitive edge development, access options and future permissible uses for passive recreation will be undertaken.

The conservation of this wetland within an urban environment depends not only on its physical protection, but also on regulating the flow and quality of water flowing into it from future urban development. Options for managing stormwater with a view to maintaining the natural flow regime through the wetland will require further investigation. A decision on the appropriate action will depend on detailed evaluation of geotechnical and hydraulic investigations of the areas around the wetland.

Other wetland and aquatic ecosystem habitat occurs through drainage lines in the North Gungahlin area. The possible treatment of these areas to enhance their ecological values, consistent with the principles of sustainable urban stormwater management, will be subject to further investigation at later detailed planning stages during the land development process.

(e) Wildlife

As identified in section 3.6, North Gungahlin and the surrounding region support a diversity of native mammals, birds, reptiles and invertebrates. The presence of many of these species in the area can largely be attributed to high value habitat contained within the various types of woodland and grassland communities found throughout the region.

The Gungahlin EIS (1989) noted that wildlife in the area is dominated by those native and introduced species that have been able to adapt to significant habitat modification due to European settlement. Kangaroos were noted as common, and the presence of the red-necked wallaby, wombat and echidna was also acknowledged. The largest group of animals known to occur were birds, including some migratory species, though no endangered or vulnerable species were recognised. The EIS also noted the scarcity of information on reptiles and amphibians found in Gungahlin. The acknowledgment of the regional significance of Mulligans Flat from an ecological viewpoint is the only reference made in the EIS to ecological issues arising from the impacts of the proposed future urban development, other than the inherent benefits for wildlife habitat associated with the EIS's proposals for the retention and enhancement of existing open space for landscape quality.

Action Plans have been prepared for the ecological communities and species listed as threatened in the ACT and several of these items occur in the North Gungahlin area. Earlier in this section, Action Plans for YBRG Grassy Woodland community and Natural Temperate Grassland communities were discussed, including Structure Plan proposals for the incorporation of elements of these communities in the future development. Coupled with the existing reservation of large tracts of the YBRG Grassy Woodland community in the Mulligans Flat Nature Reserve, high quality habitat beneficial to their associated fauna species will be retained elsewhere.

Five bird species, declared as either vulnerable or endangered, which are known to occur in the North Gungahlin area, are the subject of Action Plan No.s 15 to 18 and 20. For each of the identified species, their distribution occurs predominantly in and around the Mulligans Flat Nature Reserve, and in some instances the Gungahlin District, including the Village of Hall and its environs. The major habitat for these bird species is the YBRG grassy woodland, and the retention of large tracts in the Mulligans Flat Nature Reserve and the adjoining area of Gooroo will create one of the largest areas of protected endangered communities of this type in the region, making a substantial contribution towards the achievement of the Action Plan conservation objectives for these threatened bird species.

In addition to the areas of woodland retained around the periphery of and adjacent to the North Gungahlin development area, the proposed 'web' of open space throughout North Gungahlin will also contribute to a network of natural corridors, linking key areas of habitat within the urban fabric to these peripheral areas. Principles and policies are included in the Structure Plan to address the management of the buffer areas between the proposed future suburbs and the Nature Reserve.

While it may not be feasible to preserve the entire ecological community within the urban fabric, the habitat value of individual trees, stands of trees and landscape amenity value will be retained. Additional habitat resources for some bird species can be expected in the longer term from native gardens established by new residents.

As discussed in the Wetlands Section above, a substantial area incorporating the Horse Park wetlands is to be placed into Urban Open Space as public land with specific management requirements. This action, in part, responds to the habitat value of the wetlands for the migratory Latham's Snipe, and recognition of the importance of retaining this wetland habitat within the future North Gungahlin development area. The large curtilage area retained will assist to prevent intrusion of the wetlands by domestic pets from the surrounding areas.

The wetland will also provide habitat for several of the frog species known to occur in North Gungahlin. The Structure Plan proposes to retain the creeks and corridors with minimal change within the urban fabric in their natural location where possible, assisting ecological connectivity through the urban area. Several off-line ponds proposed by the Structure Plan to contribute to the

management of stormwater may also contain some alternative habitat value for frogs and other species in place of farm dams, removed as the development front progresses.

The endangered Golden Sun Moth (Action Plan No. 7) has been recorded at Mulligans Flat North, in the hills, ridges and buffer area north of the proposed North Gungahlin urban area. This area is already contained in the Mulligans Flat Nature Reserve, on the north side of Gundaroo Road. The Structure Plan does not propose any disturbance or development of this area.

Mulligans Flat Nature Reserve provides a refuge and habitat for the known reptile species that occur in North Gungahlin. The potential impact of the Structure Plan on these species outside the Nature Reserve due to habitat disturbance and destruction will be significant given previous experience with land development. In addition, there is not a strong tolerance to many reptile species, particularly snakes, by residents in urban areas, so retention or improvement of remnant habitat areas by residents, such as occurs for birds, is unlikely to occur.

9.3 Preferred Option

Each of these major variables has structure planning consequences for all other elements of the plan, so shifts in any one of these can generate a large number of possible combinations. The objectives and criteria have provided the basis for assessing the options and selecting a preferred combination, which has then undergone a series of refinements.

The refinement of options involved a complex design process where the fixed elements such as existing infrastructure and development, cultural environmental opportunities and constraints are overlaid with the variable elements to produce structure plan design "generators". The resulting Structure Plan provides a synthesis of these "generators" into an integrated plan for development.

The resulting urban design quality of the structure is measured in terms of its imagability - people's mental image of a place. The major aspects of imagability include legibility, congruence (the matching of environmental structure to non-spatial structure) and transparency (enabling the direct understanding of various natural, social and technical functions which occur within a settlement).

The Structure Plan is primarily concerned with the structure of the six new suburbs that make up the urban fabric, the open space network and connectivity to centres of mixed uses, provision of community facility sites, the transport network, infrastructure provision, urban edge interface, landmarks, integration of cultural heritage and environmental values, the achievement of sustainable development and orientation in time (how the present moment is linked to the now, distant past or future).

The Structure Plan therefore responds to the natural site characteristics and integrates various natural and man-made elements into a coherent urban form. Future infrastructure investment will be exploited so that functional and amenity objectives are achieved - eg. providing boulevards instead of back fenced arterial roads, watercourse parks instead of floodways.

10. THE STRUCTURE PLAN

10.1 Overview

The purpose of structure planning is to ensure that sufficient long term planning is in place and completed to a level of robustness which will enable short term infrastructure decisions to be made with confidence, having regard to the need for economic efficiency in the development of Gungahlin. Structure Plans also provides a framework for outline plans for individual suburbs and a basis for comparison on a wider district and metropolitan scale.

The key Structure Plan elements provide the basic skeleton of the future urban area based on the physical characteristics of the site, and they include consideration of topography, slope, drainage, ecology and heritage.

Overlaid on this skeleton, and necessarily integrated with it, is the land use pattern which includes the transport network, open space system, residential areas, community facility sites, especially schools and the distribution of local and group centres.

The town centre, the constructed section of Horse Park Drive, and other centres and schools are important constraints. The landscape characteristics of the area lead to a fan-shaped pattern of residential areas radiating from the town centre, divided by ridgelines into suburbs of developable land. The design of the road network has been heavily influenced by the objectives of strongly supporting an effective public transport system, with bus stops within easy walking distance of most residents and routes providing good access to local and group centres.

The concept of clustering more intensive residential development around centres has important benefits. The vitality and safety of the centre as both a commercial and community asset is enhanced, public transport becomes more accessible and is better used, and residential amenity is enhanced.

Almost all Australian cities have attempted urban consolidation programs. Even in new developments, the predominance of developing on a site-by-site basis has often led to a poor fit between adjacent dwellings, with overlooking, noise intrusion, and lack of privacy being common complaints. There are frequent claims that intermixing housing types and densities leads to real or perceived losses in real estate values of individual properties. While group or integrated housing practices can overcome these problems, the strategy of separately zoning, and of concentrating medium density housing around centres, effectively eliminates this troublesome issue.

10.2 Major Structure Plan land use elements

The Structure Plan (see **Figure 3**) shows the preferred pattern of land use. The plan is based on the needs, objectives and principles described in Sections 6, 8 and 9, that have been applied to developable areas in a manner which respects and responds to identified opportunities and constraints. Specifically, the Structure Plan respects the existing natural, heritage, cultural and developed elements of the site while responding to the requirements for housing, transport, open space, drainage, commerce etc.

The principle land uses contained in the Structure Plan are as follows:

- a continuous web of open space located along natural drainage lines and extending to other significant landscape and heritage features;
- six new residential suburbs, with estimated population capacities ranging from 3800 for Forde to 7800 for Taylor;

- extensions to existing suburbs of Ngunnawal and Amaroo;
- local centres in five of the six new suburbs;
- three group centres, two located at the main entrances to the new suburbs of Casey and Moncrieff, with the third centre in Amaroo;
- community facility sites located within local and group centres;
- areas for higher density housing included in all centres; and
- an internal “ring and radial” road network and a collector road network designed to maximise public transport usage

10.3 Policies of Urban Structure

10.3.1 Mixed Use Areas (Local and Group Centres)

The Gungahlin Retail Structure Review in 1997 and the 1999 Retail Model tests have provided background to the Structure Plan. Consultation on the development of the retail strategy during 1997 was comprehensive and included a Discussion Paper, questionnaire, public meetings and displays. The objectives of the strategy are:

- to provide convenient access for the community to a wide range of goods and retail opportunities in a competitive market;
- to encourage retail trade which stimulates investment and employment and contributes to community activities;
- to create retail centres in which change and adaptation are encouraged and supported to match community and retail needs;
- to ensure retail centres and their associated public places are designed to be functional and attractive to all users; and
- to ensure major retail development contributes directly to public place infrastructure.

In 1999 the total district spending was estimated as \$145m of which 36% was spent within the district. The long term (2020) model estimates showed district spending increasing to \$680m and supporting about 100,000m² of retail space.

The strategy proposes eight new commercial centres. All of the centres are located at sites possessing a high degree of natural interest, with the potential to create a strong “sense of place” (a place which is likely to have positive meaning for the community). They are also located at junctions in the transport system and are intended to be well served by future public transport. This objective has been reinforced by adopting mixed use policies for centre development, and by requiring higher densities within a specified radius to maximise the number and types of trips which people choose to make by public transport, walking and cycling. Mixed use areas are referred to as “local and group centres” and are sited together with other facilities such as parkland or a school in the Structure Plan (see **Figure 30**).

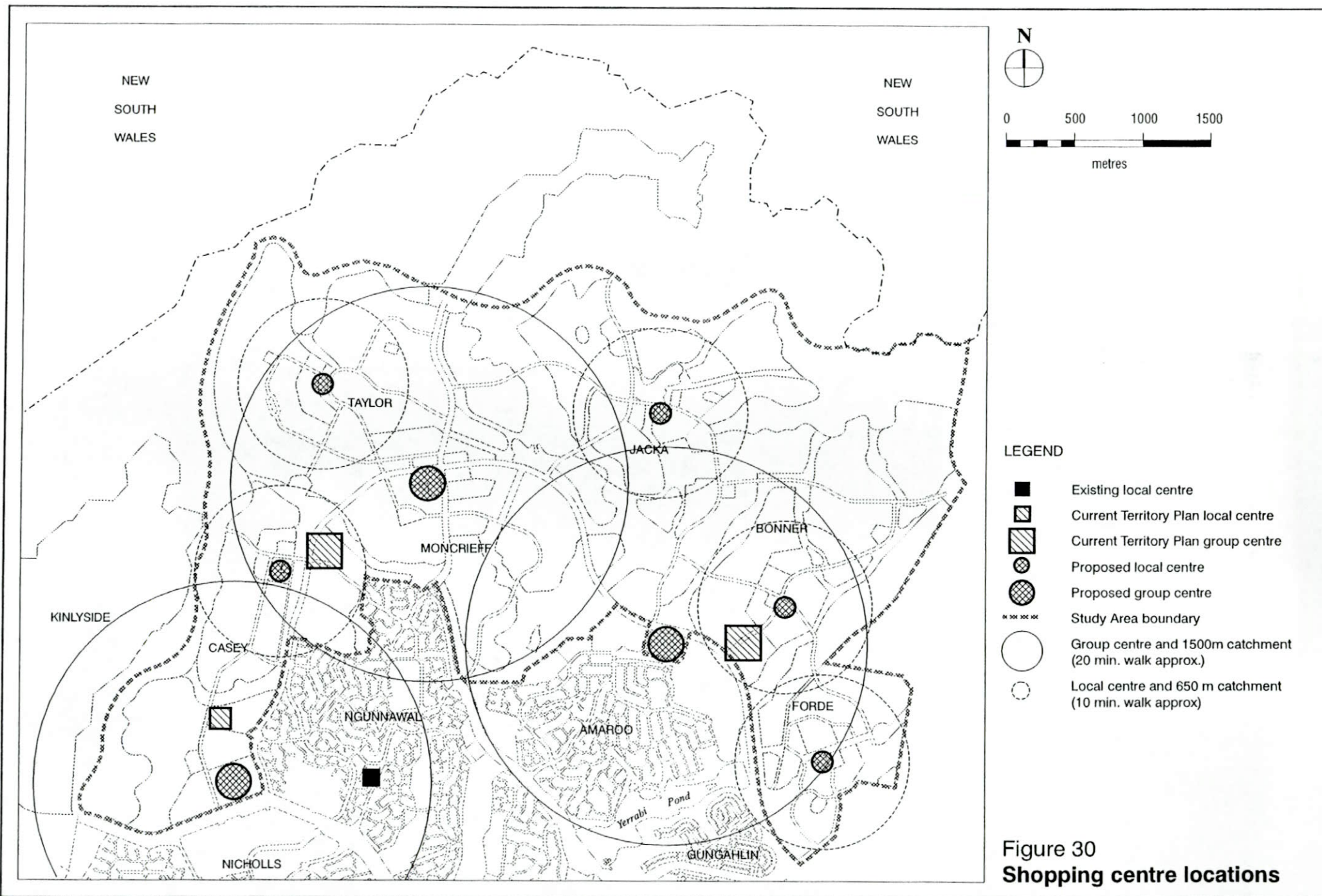
Three group centres are proposed. The planning principle is to distribute these at critical activity nodes. They will be supported by the public transport system to enable equitable, and economically efficient access to a range of facilities and services. Negative environmental effects from the development as a whole will be minimised by multiple purpose trip making; thus reinforcing the viability of businesses, encouraging public transport use and minimising road infrastructure needs. It is important to understand the strong role of retailing - its significant role in the daily life of people, its catalyst role in centres in terms of stimulating other activities and businesses, its economic role in creating jobs and contributing to gross state product; its influence on traffic flows and its relationship with transport planning and environmental considerations of less energy use and air pollution.

Casey, Mirrabai and Amaroo will be the main group centres in North Gungahlin. They will have large supermarkets as well as other commercial, entertainment and recreational uses. The size of retail space will vary between 4,000-10,000m² in these centres. Their centres will be gradually developed in accord with detailed plans. They are to be located on the main roads and at the junction of a number of suburbs to make them visible and easily accessible. Effective pedestrian and bicycle access will be integrated with their development. Mirrabai Group Centre will have the added importance of functioning as an important point of transfer between local bus and express inter-town services. Its dual roles as a centre and transit transfer point will be supported by it having the greatest concentration of adjacent medium density housing.

Five local centres are proposed, in Bonner, Casey, Forde, Jacka and Taylor. These centres will vary in size, and are primarily aimed at provision of convenience shopping, with a retail component of between 200 and 700 m². They may also include non retail commercial uses, intended to be no greater than 100sqm gross floor area of commercial space located adjacent to a transit stop and local park. Such commercial uses are intended to be less than 50% of floor space occupying a block associated or attached to residential development. Other areas of higher density residential use surround these commercial uses.

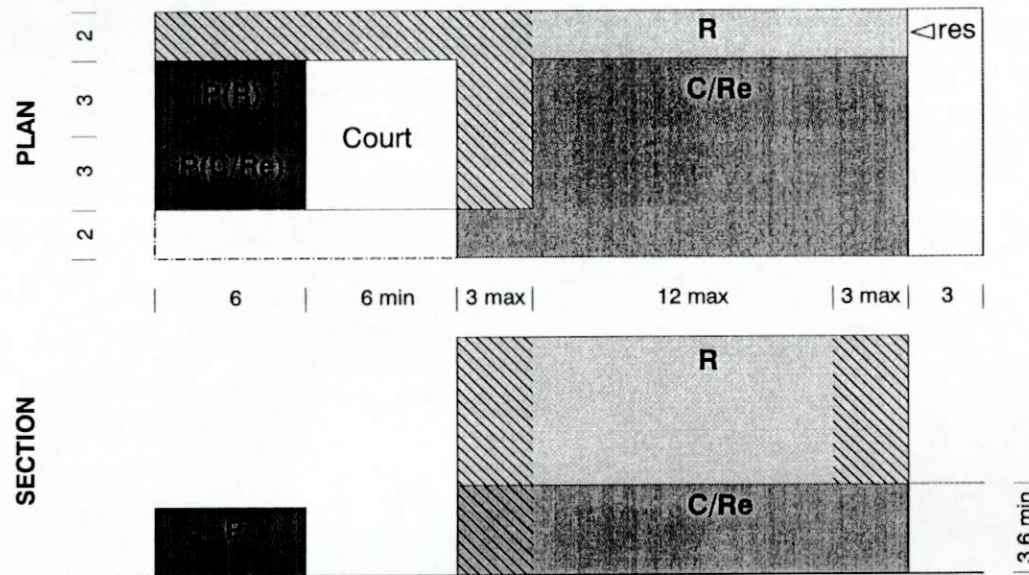
The strategy proposes that local and group centres to provide convenience shopping within walking distance of residential areas. These nodes will be designed to provide some areas which have the flexibility for uses to change. For example, in these areas, it will be possible to mix a shop/business and residence on a single block or among several blocks (See **Figure 31**). The nature of activities in these areas may vary, depending on the needs of community or the interest of the businesses. Land for mixed use development, including a convenience shop and residential, will be made available from the early days of a suburb's establishment to provide timely access to basic goods. Land releases will be programmed gradually on a block basis as demand occurs in the area.

The strategy recognises Mitchell as a major industrial area to serve the metropolitan area and as a service trades area to serve Gungahlin and North Canberra. The Mitchell land will need to be retained for industrial purposes. Specialised retailing such as car sales, and construction materials will continue to be permitted in Mitchell. Otherwise retail and commercial facilities will be encouraged for location in commercial centres.



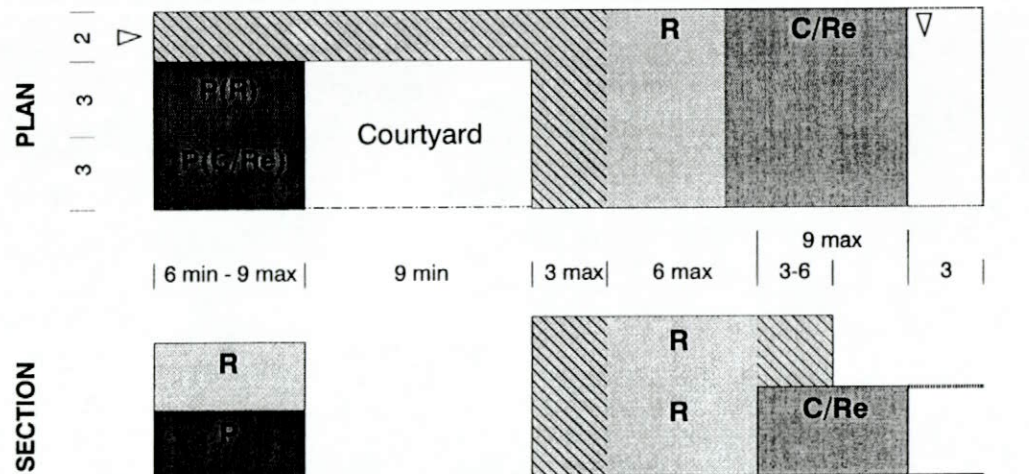
TYPE : Mixed use 1

Specialty shop, commercial and apartment



TYPE : Mixed use 2

Specialty shop, commercial and apartment



NOTES :

All dimensions are in metres

PRIMARY ENVELOPE:

Storey is defined in the Territory Plan.
Number of storeys will be determined by the Territory Plan (generally two or three storeys).
No orientation constraint.

ARTICULATION ELEMENTS:

Compulsory: Awning or arcade to street frontage.
Optional: Balcony; bay window; dormer; loggia; pergola; terrace; and verandah.

PARKING

As required by the ACT Parking Guidelines

LEGEND

- ▷ Entry
- av Average
- C** Commercial
- R** Residential
- Re** Retail
- P** Car parking
- Min Minimum
- Max Maximum
- Primary envelope - Residential
- Articulation elements
- Primary envelope - Retail/Commercial
- Parking
- Property boundary
- Awning

Figure 31
Mixed use building guidelines
schematic

Mixed Use Centres Strategy

Areas which are intensively developed focus on the Commercial Centres, which contain retail, office, and community uses. These centres are located at points of higher accessibility in the transport system. Higher density residential uses surround this core of commercial and community uses.

Commercial Land Uses are closely allied to school sites, (which are shown on the Plan as community uses), and to higher density residential development, having a gross residential density of a minimum of 20 dwellings per hectare. Commercial Centres should also provide for smaller scale community uses.

Areas of residential use around centres shall be zoned B8 and B9. The B8 zoning includes provisions that foster a wide variety of commercial, entertainment, and community functions within housing areas.

The Mirrabai Group Centre will provide for the integration of transit interchange, and commercial development. This will be in a form that supports the extension of the IPT route to this location.

10.3.2 Community facilities

Community facilities are an important element in the urban environment. Schools and outdoor recreation areas are integral components in the form and structure of urban areas. Traditionally, the primary school was the central focus of the neighbourhood. Now other facilities, including community centres, libraries, outdoor recreation areas and places of worship will enable Gungahlin communities to develop and express their cultural identity. This will in turn play a major role in the social and economic wellbeing of Gungahlin.

In terms of the location of community facilities and services, widely accepted principles of site selection include:

- accessibility by public transport and safe and adequate parking provision;
- locations in places where people already have cause to congregate, rather than stand alone sites, for reasons of safety, accessibility, convenience, visibility and capacity for a "one stop shop";
- shopping centres and schools are recognised as the key places where people tend to congregate, and;
- proximity to other personal services, for similar reasons and to provide opportunities for the shared use of resources.

Depending on the nature of the facility, locations adjacent to open space or recreation areas can be an advantage, to allow for overflow activities and associated children's play activities. It is important to locate facilities to maximise access to all service users, including users who are dependent on public transport. In general, the main location for community facilities will be either in the planned centres or adjacent to other related facilities, particularly schools.

To ensure that sufficient community facilities sites are identified and reserved as part of the planning process to meet anticipated and possible future requirements, the Structure Plan allows for community facilities sites to be included as part of the mixed use centres, ensuring that they are located on major public transport routes. The Structure Plan has identified possible community facilities sites within the open space system with at least one site adjacent to each district level open space. If sites are not required in the longer term they can be incorporated into the open space system, reducing holding costs for government in the interim. The Structure Plan has also reserved one larger site that could either be used for an additional school site in Forde, if required or for an

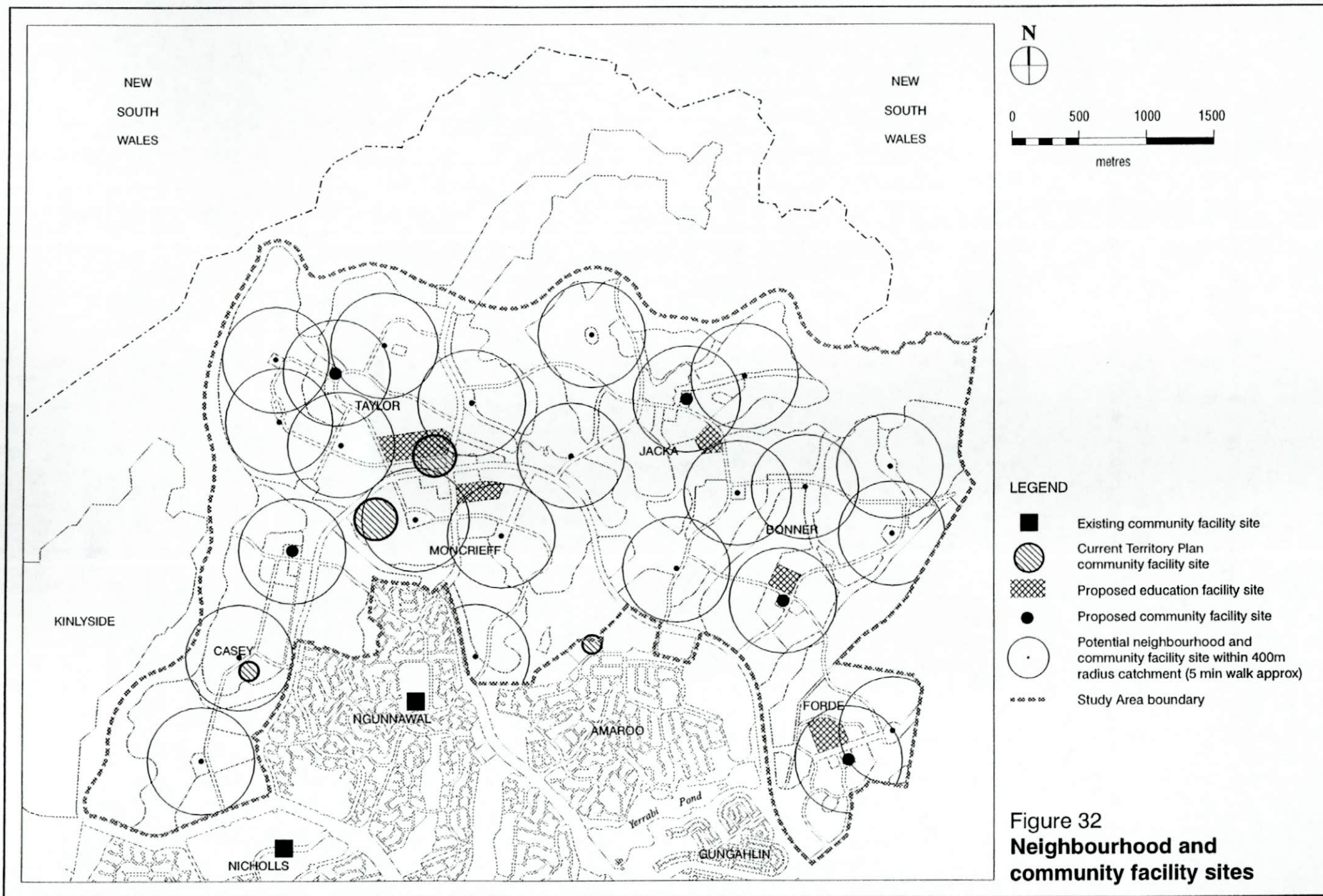


Figure 32
**Neighbourhood and
 community facility sites**

aged persons development. These sites are in addition to the current proposed number of educational facilities (see **Figure 32**).

Community Facilities Strategy

Community facilities will be provided within or adjacent to major centres and open spaces. The provision of sites will include additional lands for a secondary college and an additional (and possibly private) school. If not required for education purposes, these sites will be available for other community purposes or special categories of housing, (such as housing facilities for the aged).

10.3.3 Residential Suburbs

The natural landscape structure has been used to define the character of residential suburbs. Where residential uses form part of the mixed use areas around a proposed local or group centre, density controls are recommended, which would require a minimum of 20 dwellings per hectare within 200m of a local centre and within 400m of a group centre. Remaining areas of residential land are assumed to yield a net average of 13 dwellings per gross hectare, where gross hectare is defined as all residential area excluding open space areas and arterial or distributor roads.

The basic structure of each suburb can be summarised as:

- the local centre, which would typically incorporate a small group of adaptable buildings together with a park and in most cases a primary school;
- local parks of approximately 0.5 to 1 hectare within 400m of 90% of dwellings, containing significant landscape features and deliberately located to conserve representative areas of native vegetation;
- a linear open space network based primarily on drainage lines, incorporating pedestrian paths and cycleways, and interlocking with local centres and bus stops;
- clearly articulated road hierarchy where the engineering design and landscape treatment reflect the intended traffic function of each street; and
- defined local bus routes with potential bus stops within 500m of at least 95% of dwellings.

Bonner

With an emphasis on natural landscape to delineate character areas or suburbs it has been useful to identify a separate suburb (Bonner) between Jacka and Forde. This topographic definition determines that it is a relatively large suburb. The western edge contains linked hilltop parks, the northern edges are permanently non-urban. A central and eastern spine is based on the existing drainage paths and incorporates an Aboriginal scar tree which is recommended for further investigation. Adjacent to the central spine is a school/park/mixed use area which is deliberately located in the lower part of the suburb to maximise exposure to passing customers. The area is built up on clusters of walkable neighbourhoods served by a linking open space system and by linked road/public transport routes (see **Figure 33**).

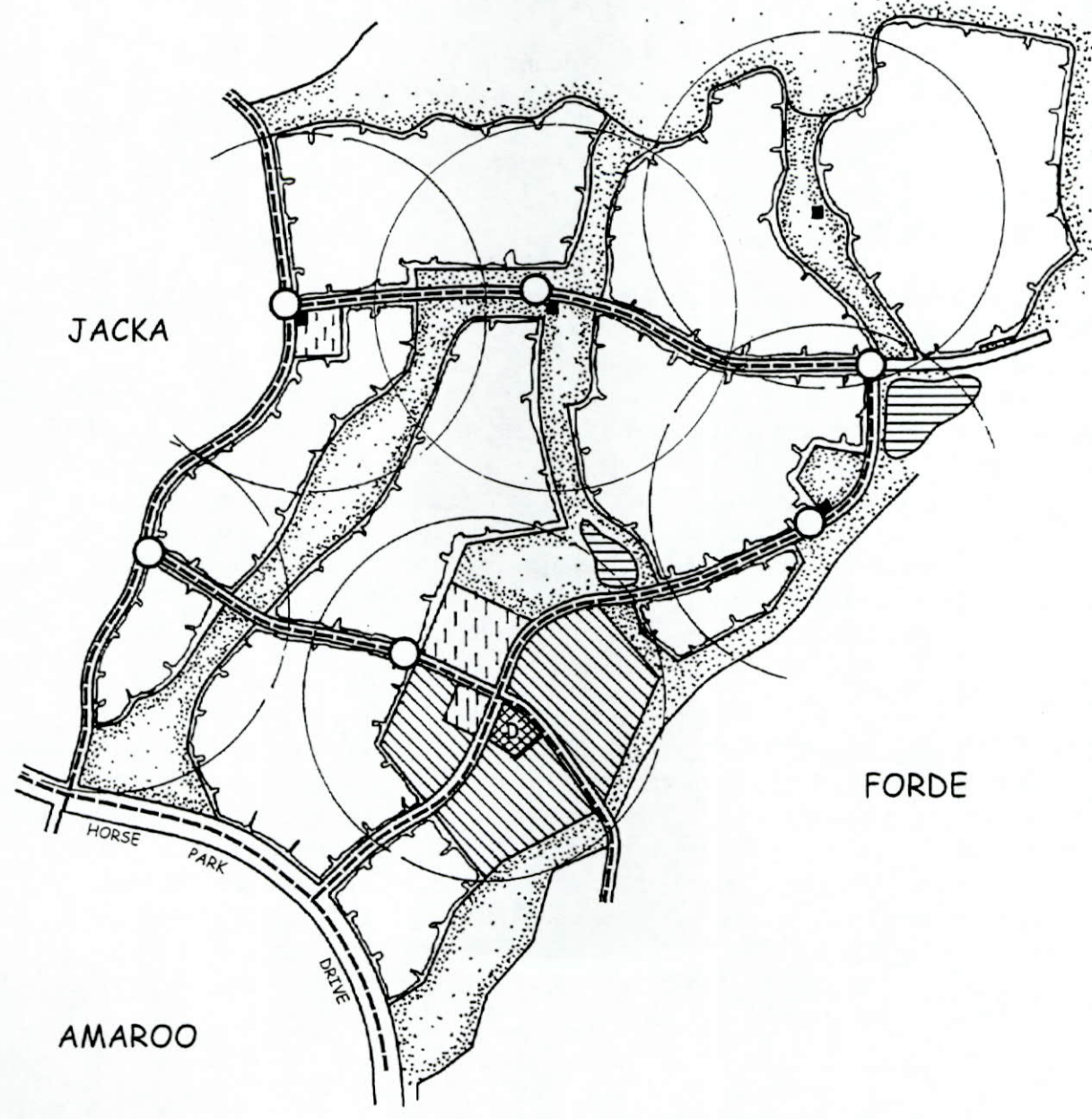
Land Type	Area (ha) (approx.)	Dwellings (approx)	Population (approx)
Residential @13d/ha & 2.6 p/dw	177	2300	6000
Urban Residential @20 d/ha & 1.8 p/dw	17	340	600
Open Space	50.2	-	-
Community Facility	4.3*	-	-
Population Total	-	-	6600

- Note: Includes a school site

LAND TYPE	AREA(ha) approx	DWELLINGS approx.	POPULATION approx
Residential @ 13dw/ha and 2.6p/dw	177	2300	6000
Urban residential @20dw/ha and 1.8p/dw	17	340	600
Open space	50.2		
Community facility	4.3*		
Population Total			6600

Note: *includes a school site

MULLIGANS
FLAT
NATURE
RESERVE



LEGEND

- Residential
- Higher density residential
- Open space
- Community facility (including schools)
- Local centre
- Water detention feature
- Possible community facility site
- Possible bus route
- Possible bus stop
- 400m radius - 5min walk

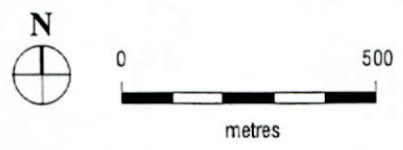


Figure 33
Bonner - Outline Plan

Casey

The suburb of Casey runs north-south between Horse Park Drive and the major ridge to the west which separates this area from Kinlyside and Hall. A major east-west corridor is proposed to bisect the suburb linking back to the ridge and allowing the preservation of significant tree stands. This in turn links to an important line of trees marking an old north-south road alignment and gives character to the north-east part of the suburb. A group centre is planned for Casey in its south-eastern corner and with this and schools at Gold Creek (Nicholls) and Ngunnawal the suburb is well served by major facilities. A local centre is proposed in the northern sector that would also serve the northern parts of Ngunnawal. The site offers spectacular east facing aspects from the land as it slopes down from the ridge (see **Figure 34**).

Land Type	Area (ha) (approx)	Dwellings (approx)	Population (approx)
Residential @13d/ha & 2.6 p/dw	119	1550	4030
Urban Residential @20 d/ha & 1.8 p/dw	25	500	900
Open Space	25.5	-	-
Community Facility	1.4	-	-
Population Total	-	-	4930

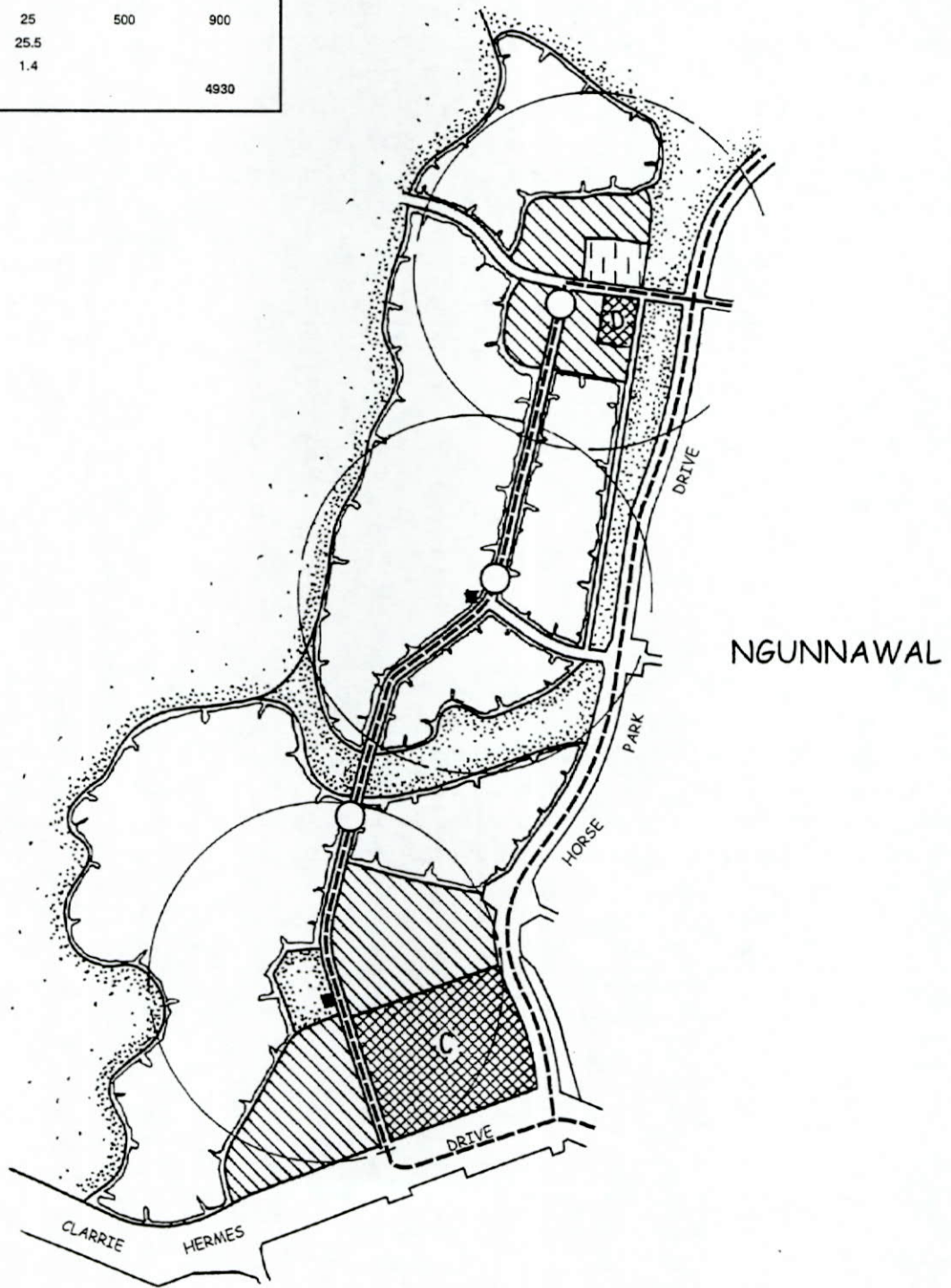
Forde

Forde is defined under the proposed Structure Plan as lying to the east of Horse Park Drive. It is a highly defined location being contained by Mulligans Flat and the major structure of Horse Park Drive which coincides with low lying land in the south. The suburb is also adjacent to the Gungahlin Town Centre. An open space spine is proposed to run through the suburb linking Mulligans Flat to the central area and a mixed use area, and possible school site central to the suburb. It is proposed that Gundaroo Road becomes an open space trail within Forde thereby allowing the line of trees to be preserved and the symbolic connection to an old route alignment to be celebrated (see **Figure 35**).







Land Type	Area (ha) (approx)	Dwellings (approx)	Population (approx)
Residential @13d/ha & 2.6 p/dw	92	1200	3120
Urban Residential @20 d/ha & 1.8 p/dw	19	380	680
Open Space	33.5	-	-
Community Facility	6.3	-	-
Population Total	-	-	3800





*Note: does not include reserved community site

LAND TYPE	AREA(ha) approx	DWELLINGS approx.	POPULATION approx
Residential @ 13dw/ha and 2.6p/dw	119	1550	4030
Urban residential @20dw/ha and 1.8p/dw	25	500	900
Open space	25.5		
Community facility	1.4		
Population Total			4930



LEGEND

-  Residential
-  Higher density residential
-  Open space
-  Community facility (including schools)
-  Local centre
-  Group centre

-  Possible community facility site
-  Possible bus route
-  Possible bus stop
-  400m radius - 5min walk

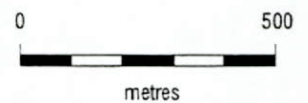


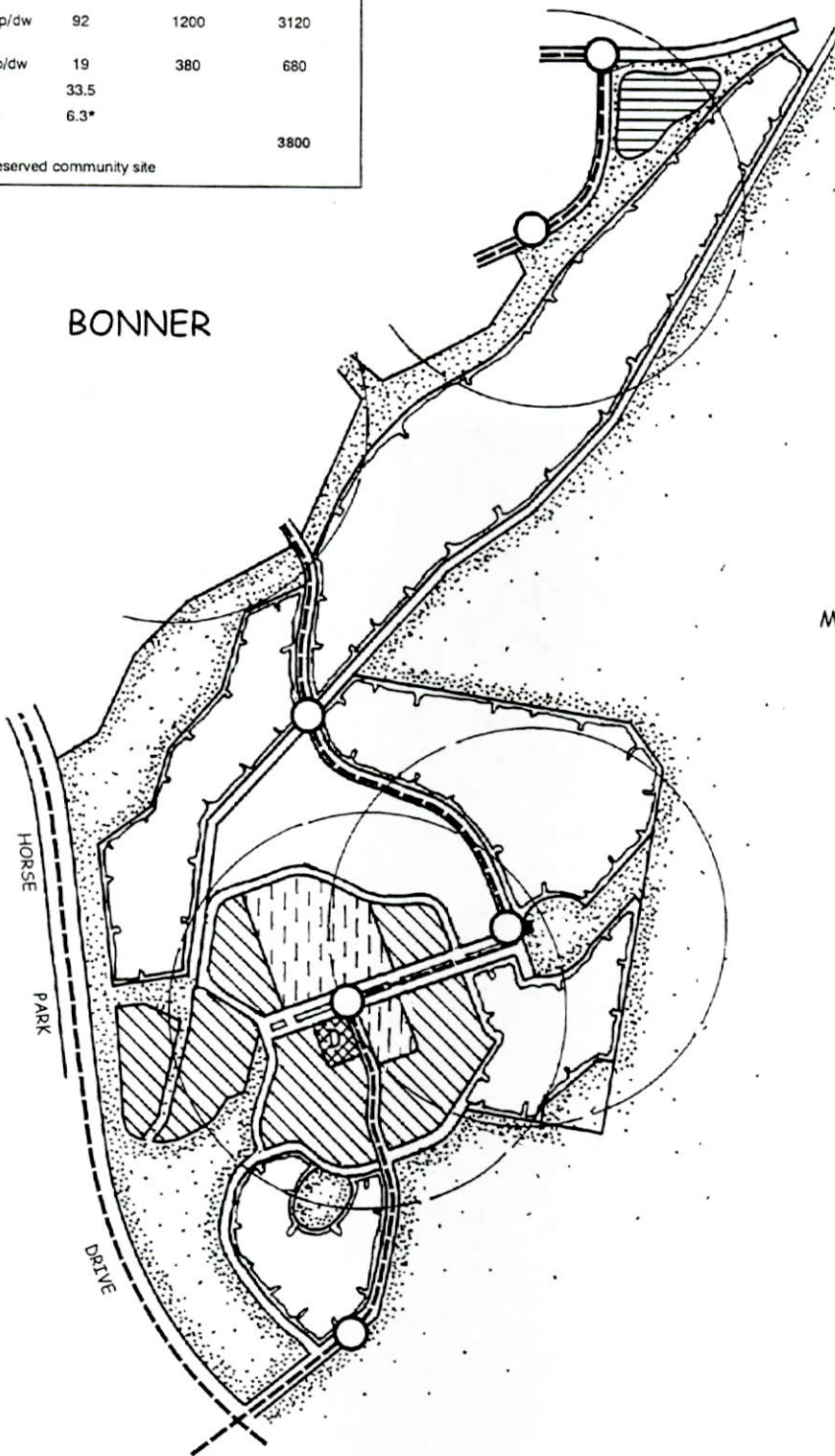
Figure 34
Casey - Outline Plan

LAND TYPE	AREA(ha) approx	DWELLINGS approx.	POPULATION approx
Residential @ 13dw/ha and 2.6p/dw	92	1200	3120
Urban residential @ 20dw/ha and 1.8p/dw	19	380	680
Open space	33.5		
Community facility	6.3*		
Population Total			3800

Note: *includes a reserved community site

BONNER

MULLIGANS
FLAT
NATURE
RESERVE



LEGEND

- Residential
- Higher density residential
- Open space
- Community facility (including schools)
- Local centre
- Water detention feature

- Possible community facility site
- Possible bus route
- Possible bus stop
- Possible bus terminus
- 400m radius - 5min walk

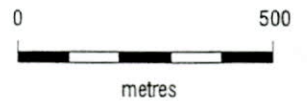


Figure 35
Forde - Outline Plan

Jacka

This is a large, physically complex and interesting area in the central northern location of the Study Area. Entering from Horse Park Drive the visitor would be quickly adjacent to the Horse Park Wetland and heritage conservation area which is connected back to a hill reserve system and lookout point on high vantage point within the suburb. In turn this spur contains the upper reaches of the suburb and connects back to the rural land to the north.

The creek, which feeds the wetland, gathers a number of tributary drainage lines which contribute to a linear park system. An Aboriginal scatter on a 2 hectare site in the north-west of the area is reserved in open space for further investigation. Central to the suburb and upstream from the wetlands is a local centre consisting of a park, primary school site, a water management pond and a mixed use area. The Amaroo Group Centre is conveniently located to serve most residents as they leave or enter Jacka (see **Figure 36**).

Land Type	Area (ha) (approx)	Dwellings (approx)	Population (approx)
Residential @13d/ha & 2.6 p/dw	153	1990	5170
Urban Residential @20 d/ha & 1.8 p/dw	24	480	860
Open Space	90.2	-	-
Community Facility	4.3 *	-	-
Population Totals	-	-	6030

* Note: includes a school site

Moncrieff

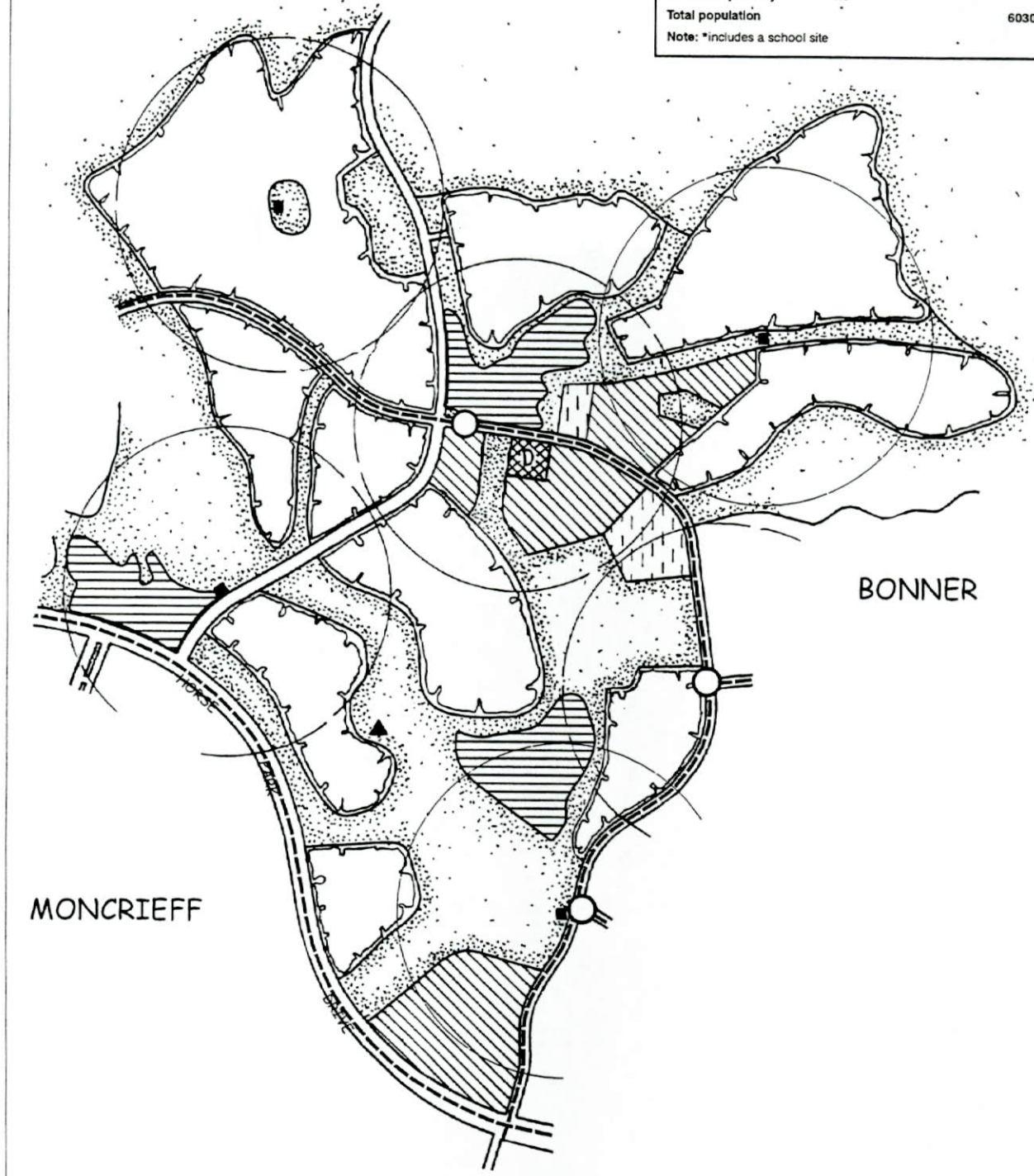
This is a relatively small suburb well served by facilities at its edge, particularly the Taylor/Moncrieff Group Centre (Mirrabei) as well as the Amaroo schools and group centre. It is essentially made up of three hills and has little or no flat land. In addition to the hills, it is defined by Horse Park Drive which arcs around its northern, eastern and western boundaries. (see **Figure 37**).

Land Type	Area (ha) (approx)	Dwellings (approx)	Population (approx)
Residential @13d/ha & 2.6 p/dw	100	1300	3380
Urban Residential @20 d/ha & 1.8 p/dw	24	480	860
Open Space	22	-	-
Community Facility	4.6*	-	-
Population Total	-	-	4240












* Note: includes reserved community site

LAND TYPE	AREA(ha) approx	DWELLINGS approx.	POPULATION approx
Residential @ 13dw/ha and 2.6p/dw	153	1990	5170
Urban residential @20dw/ha and 1.8p/dw	24	480	860
Open space	90.2		
Community facility	4.3*		
Total population			6030

Note: *includes a school site



LEGEND

-  Residential
-  Higher density residential
-  Open space
-  Community facility (including schools)
-  Local centre
-  Water detention feature
-  Lookout
-  Possible community facility site
-  Possible bus route
-  Possible bus stop
-  400m radius - 5min walk

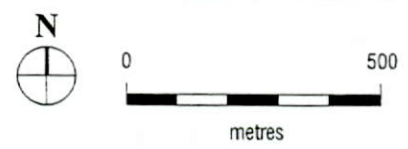
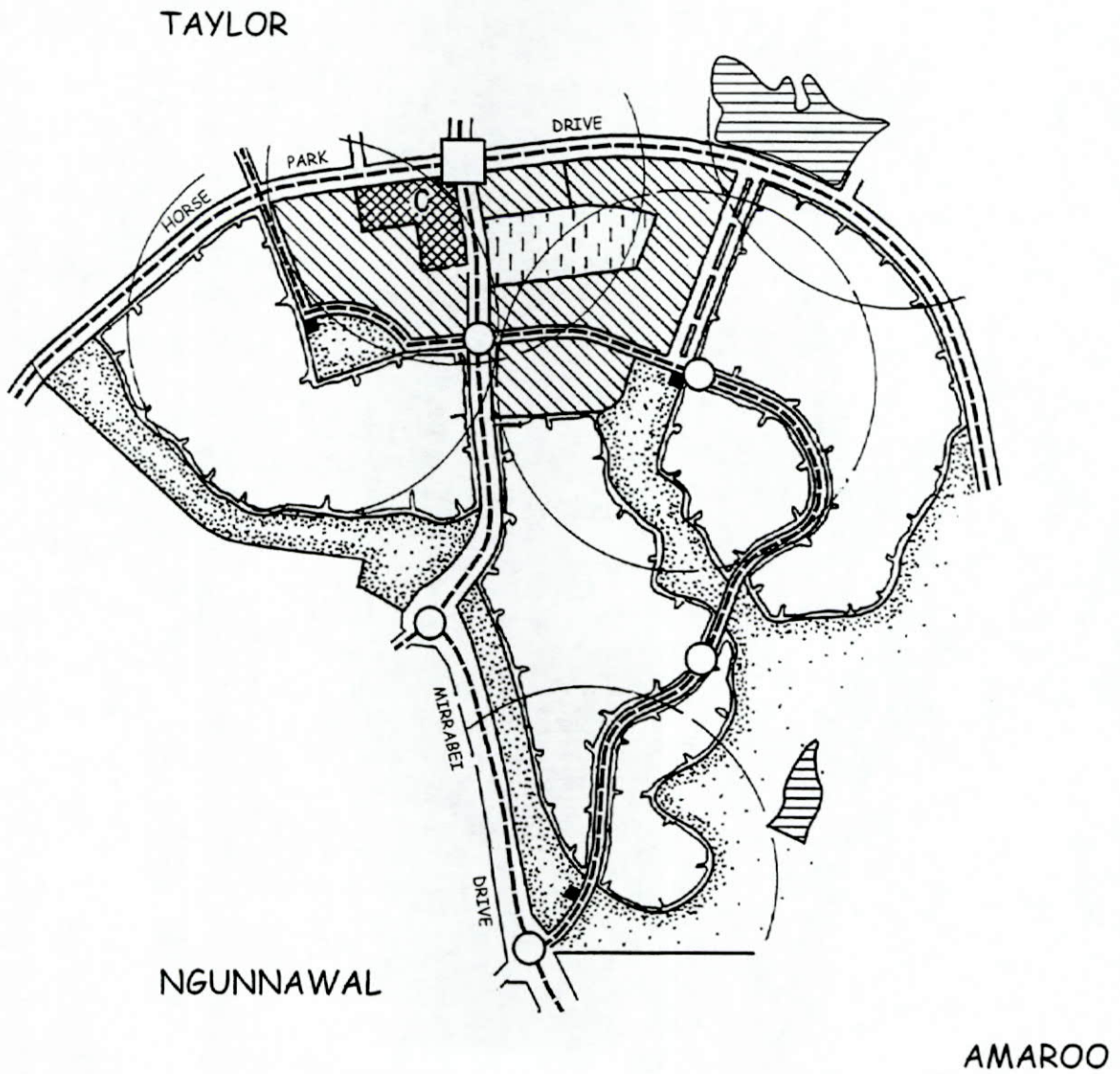













Figure 36
Jacka - Outline Plan

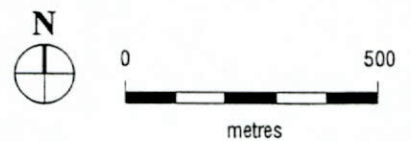
LAND TYPE	AREA(ha) approx	DWELLINGS approx.	POPULATION approx
Residential @ 13dw/ha and 2.6p/dw	100	1300	3380
Urban residential @20dw/ha and 1.8p/dw	24	480	860
Open space	22		
Community facility	4.6*		
Total population			4240

Note: *includes a reserved community site



LEGEND

-  Residential
-  Higher density residential
-  Open space
-  Community facility (including schools)
-  Group centre
-  Water detention feature
-  Possible community facility site
-  Possible bus route
-  Possible bus stop
-  Possible bus terminus
-  400m radius - 5min walk



**Figure 37
Moncrieff - Outline Plan**