

Ngunnawal 2C

Concept Plan



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1. INTRODUCTION

The Ngunnawal 2C Concept Plan Report outlines the planning objectives, principles and important planning requirements for the proposed residential estate which will inform more detailed future planning and development of the estate.

Concept planning is the next step towards development after the 2003 Structure Plan and Variation No.130 to the Territory Plan for North Gungahlin. The Concept Plan has been adopted as a Planning Guideline under the Territory Plan. As such, the Concept Plan guides planning decisions and is required to be taken into consideration in development and land use proposals.

A Concept Plan is a planning tool which provides a greater level of detail than previous investigations (such as the North Gungahlin Structure Plan) by refining notional land uses, broad infrastructure requirements, higher order road network, key features and boundaries of the estate. The Concept Plan also identifies important planning requirements.

2. BACKGROUND

Ngunnawal 2C is identified by the Territory Plan as having a Residential Land Use Policy with a Defined Land Overlay.

The area was previously identified for future residential development as part of the North Gungahlin Structure Plan. The development of Ngunnawal 2C was also confirmed through Variation 130 to the Territory Plan for North Gungahlin as well as the Canberra Spatial Plan. However a 'spur' of land in the north-eastern part of the study area was changed to public open space under Variation 130 to the Territory Plan in 2003.

3. SITE DESCRIPTION

The site is located in north-west Ngunnawal bounded by the future alignment of Horse Park Drive, an existing creek (tributary of Ginninderra Creek) and existing residential dwellings in the established parts of Ngunnawal. Figure 1 shows the site in the metropolitan and suburban context.

The site comprises the eastern part of a small valley between Ngunnawal and Kinlyside as shown in Figure 2. It is gently undulating in the lower (western sections) rising to steeper sections in the east.

The site comprises approximately 44 ha. However, the area available for development is 33.03ha as a result of several development constraints. The ridgeline reserve on the eastern side of the site is to be expanded to encompass the existing grove of trees near the centre of the site plus extensions to connect with the creekline to the north and the existing areas of open space to the south. An existing park and stormwater management area is also to be enlarged. This additional area of public open space is approximately 8.8ha which is in addition to the 1.2ha of land to the north of Barak and Miago Courts, which was initially part of the study area but allocated as public open space under Variation 130 to the Territory Plan in 2003.

The site is exposed to the prevailing summer north-westerly winds as well as the cold (and sometimes intense) south-westerly winter winds. While the site is generally elongated north - south, it is sufficiently wide enough to ensure that a residential estate can be designed to achieve a northern aspect with good solar access for future residents.

Figure 1: Metropolitan and Local Context

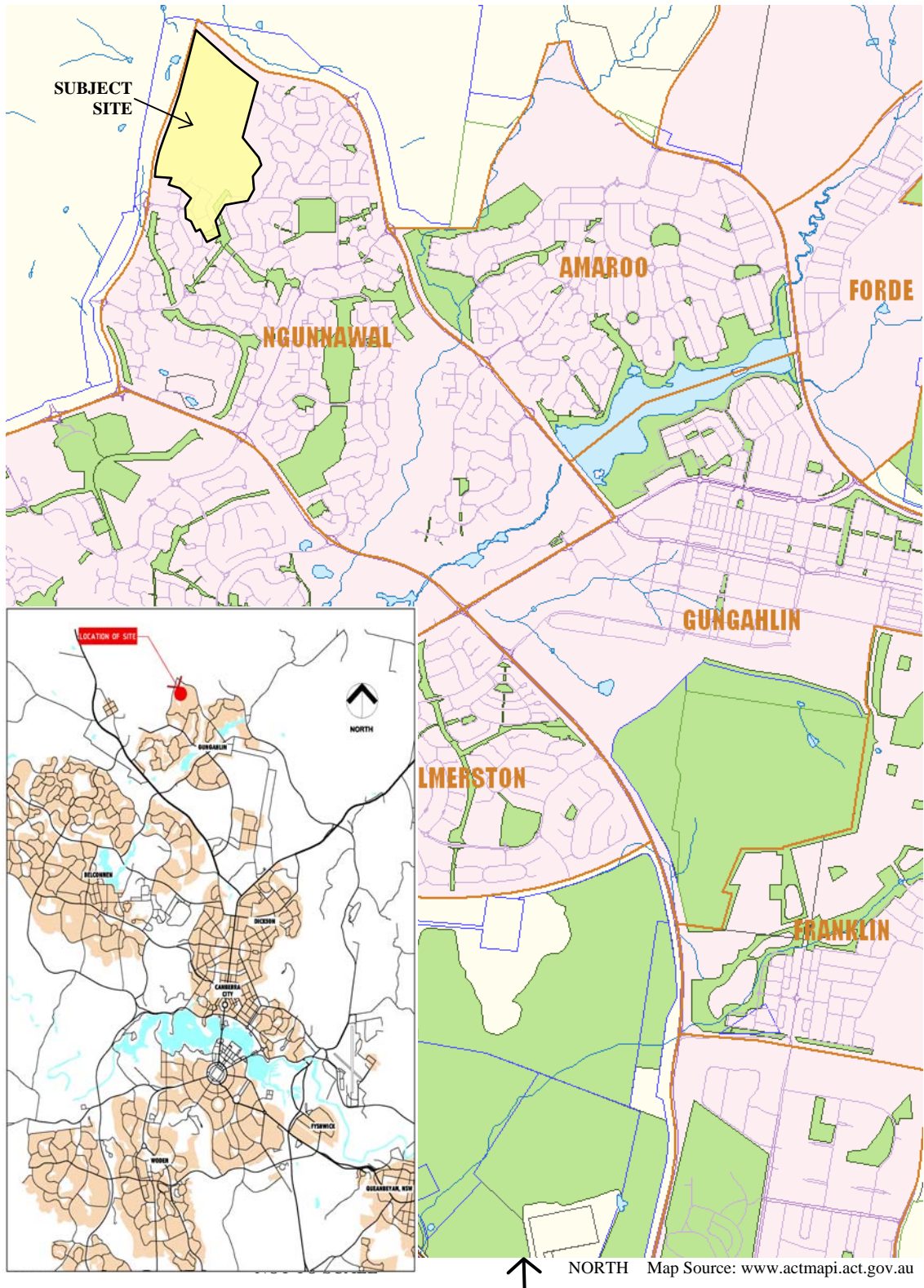


Figure 2: Site Plan (Air Photo)



4. CONCEPT PLAN

The Concept Plan for Ngunnawal 2C is shown in Figure 3. The Concept Plan shows the broad planning framework for the estate based on the identified planning objectives.

The Concept Plan is supported by the Indicative Landscape Principles Plan and Indicative Engineering Master Plan that show planning, engineering and environmental issues, taking into account all the identified constraints and opportunities for the site.

The primary attributes of the Concept Plan are detailed in the Background Planning Study report and summarised below:

4.1 Planning Objectives

The following planning objectives and principles have been adopted for the Concept Plan:

- Develop an integrated, diverse community with a strong identity and sense of place by ensuring flexibility to meet changing needs through a diverse housing product, a variety of living options and affordable housing;
- Provide a high level of permeability and connectivity with adjoining suburbs particularly Casey and Ngunnawal;
- Provide safe, compact and walkable residential precincts with easy access to recreational, commercial and community facilities;
- Incorporate innovations in Water Sensitive Urban Design (WSUD) and reduction of greenhouse gas emissions.

4.2 Planning Principles

- Planning and development of Ngunnawal 2C should incorporate and take advantage of the environmental, social, cultural and economic sustainability characteristics to support and strengthen the community's identity.
- An integrated, legible, safe and convenient cycling and pedestrian network should connect to commercial areas in Ngunnawal, Casey and later in Moncrieff, parks and ridge within Ngunnawal 2C and provide links to trunk routes, services and facilities in other areas of Gungahlin and Canberra.
- Bushfire risk should be considered and mitigated appropriately in the planning and development of the suburb and its buffer areas.
- Water sensitive urban design principles are to be adopted to secure economic, social and environmental benefits and to assist in achieving the targets identified in the 'Think Water Act Water' strategy for sustainable water use in the ACT.
- Subdivision design should encourage housing diversity and maximise Ecologically Sustainable Development (ESD) performance with opportunities for increasing residential density around parks and at the main entrance to the estate off Horse Park Drive.
- Subdivision design must ensure optimum solar orientation of residential blocks.

4.3 Housing Mix

The concept plan provides for a mix of housing types with flexibility to meet changing market needs and government policies and guidelines. These will range from detached housing on larger blocks through to compact attached and/or detached housing on smaller blocks.

4.4 Traffic / Road Connections

The main vehicle access will be from Horse Park Drive. Two further connections into the existing suburb of Ngunnawal are also proposed, at Burrumarra St to the east and Jabanunnga Avenue to the south.

4.5 Public Transport

Bus routes are intended to use the Collector roads (Burrumarra Street and Jabanunnga Street) as well as Horse Park Drive upon its completion as an arterial road.

Actual bus routes and the location of bus stops will be determined by ACTION at the appropriate time to ensure at least 90% of dwellings will be within 400 metres of a bus stop.

The extension of Jababunnga Ave (the north-south collector road) is unlikely to be required for a bus route, but its design as a collector road will ensure allowance is made for possible public transport links if required in the future.

4.6 Pedestrian / Bicycle Network

The Concept Plan includes a series of linked open spaces that accommodate a system of interconnected pedestrian and bicycle paths to allow convenient movement within and through the estate to adjoining areas of Ngunnawal as well as the future suburb of Casey to the west. Pedestrian footpaths along all local streets complement these pathways.

On-road cycle ways are provided to the two collector roads. Cycle routes are also proposed for Horse Park Drive and paths within the estate are to connect with this network.

4.7 Open Space Structure

The Concept Plan significantly enhances the existing open space network by expanding the area of the existing ridgeline reserve to incorporate all of the trees along the ridge plus the stand of mature eucalypts on the eastern slope of the site. This ridgeline reserve is also extended to provide linkages to the north to connect with the existing creek system and associated open space corridor, plus extension to the south to connect with the existing path system within Ngunnawal.

Additional local open space is provided with expansion of an existing playground at the southern end of the site plus provision of two new playgrounds, one in the centre of the estate adjacent to the grove of existing trees and the other at the northern end of the estate adjacent to the existing creek. Pedestrian and bicycle links to the wider area are established through connection of the ridgeline reserve to the creek corridor reserve.

4.8 Urban Edge Treatment

The Ngunnawal 2C site adjoins a creek corridor plus a ridgeline of public open space, which could present a bushfire risk to development on the edge of the estate. Accordingly, relevant Asset Protection Zones are incorporated into the planning for the estate in accordance with the Bushfire Risk Assessment to minimise the risk from bushfires.

4.9 Environment Conservation

Consistent with the Territory Plan, the ridgeline corridor is to be retained as Urban Open Space between the new development and other established parts of Ngunnawal.

This area provides an ecological corridor for fauna movement along the ridgeline to the creek corridor due to the eucalypt tree plantings and native ground cover.

Figure 3: Concept Plan



5. INDICATIVE LANDSCAPE PRINCIPLES

The Indicative Landscape Principles Plan recognises and responds to the general planning objectives and principles contained in the Concept Plan. Figure 4 Landscape Principles Plan shows the broad landscape intentions, the main elements of which are discussed below.

5.1 Estate Entry Feature

The main entry to the estate from Horse Park Drive should have strong and distinctive formal planting to enhance the sense of arrival.

Place-making elements such as signage should be promoted at this main entry point.

5.2 Street Plantings

The existing parts of Ngunnawal have an established streetscape. Where possible, the same or similar species of plants should be continued through the Ngunnawal 2c estate.

Local streets are also to include similar species to those already planted in surrounding areas of Ngunnawal.

5.3 Local Parks

The existing playground in the south (Iterra Grove (see Figure 2)) is to be extended and new playgrounds provided in the centre of the estate (adjacent to the grove of existing trees) and in the north (adjacent to the creek). This northern playground will require plantings of large deciduous trees to provide summer shade.

Parks and playgrounds should incorporate strong and distinctive planting to enhance legibility although care should be taken with the selection of trees adjacent to playgrounds.

Bush Fire Risk Assessment mitigation requirements apply to planting in the open space ridgeline and edge roads.

5.4 Landscaping of Swales and Retention Ponds

Swales and detention ponds should be constructed in accordance with the principles outlined in *Water Ways: Water Sensitive Urban Design General Code* to ensure that overland flows are filtered and slowed with the use of vegetation such as grasses and reeds as well as larger plants. Landscaping should ensure that there are areas to enable public interaction while ensuring the ponds serve their primary purpose as a water quality control pond.

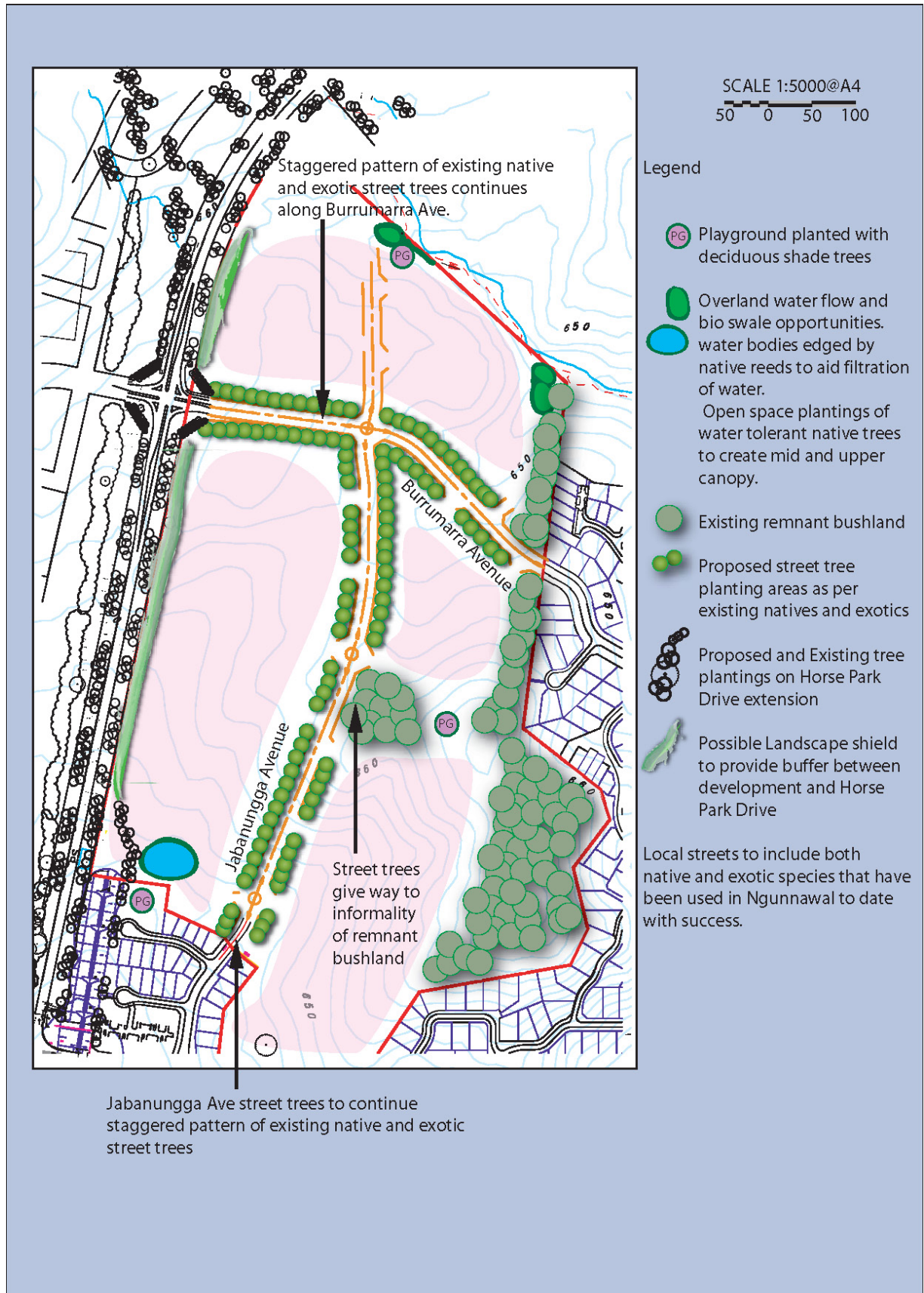
The inclusion of elements such as rocks, boulders and pedestrian bridges, where appropriate, is encouraged.

5.5 Existing Trees

The existing grove of native trees in the centre of the estate form an important landscape element and are intended to be retained as part of an extended area of public open space in the Concept Plan.

It is also intended that all of the trees within the study area that have been assessed as 'high' or 'exceptional' value are retained under the Concept Plan. However, this will be the subject of further detailed assessment as part of the Estate Development Plan.

Figure 4: Landscape Principles Plan



6. IMPORTANT PLANNING REQUIREMENTS

The planning principles are identified within the following sub groups:

6.1 Ecological Requirements

The study area does not fall within the major woodland corridor linkages identified in the *ACT Lowland Woodland Conservation Strategy* (Action Plan No.27).

There are no species or ecological communities which are listed as threatened under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC 1999) present within the study area.

The ridgeline area is of moderate ecological value, which could be enhanced by connectivity with surrounding natural areas and ensuring the open space area includes the central grove of trees and the southern extent of the ridgeline.

The ecological potential of the northern part of the site lies mainly in contributing to a natural corridor along the creek line. Additional land added to this corridor to the north of the creek, would be of ecological benefit. Connections between the creek corridor and the ridgeline are also desirable.

6.2 Open Space Provision

The Concept Plan includes areas of open space totalling about 8ha that are to be provided generally in accordance with the Important Planning Requirements Plan.

6.3 Tree Protection

A detailed tree survey and assessment was undertaken that identified individual trees and tree groups. This information was reviewed by Tree Protection Unit of Territory & Municipal Services (TAMS) and their comments incorporated into assessment.

It is intended that all of the trees within the study area that have been assessed as 'high' or 'exceptional' value are retained under the Concept Plan. However, this will be the subject of further detailed assessment as part of the Estate Development Plan.

6.4 Geotechnical Assessment

A Preliminary Geotechnical Assessment of the site, undertaken by Geotechnical Consultants Pty Ltd in June 2003 has highlighted three categories of geological constraints, including:

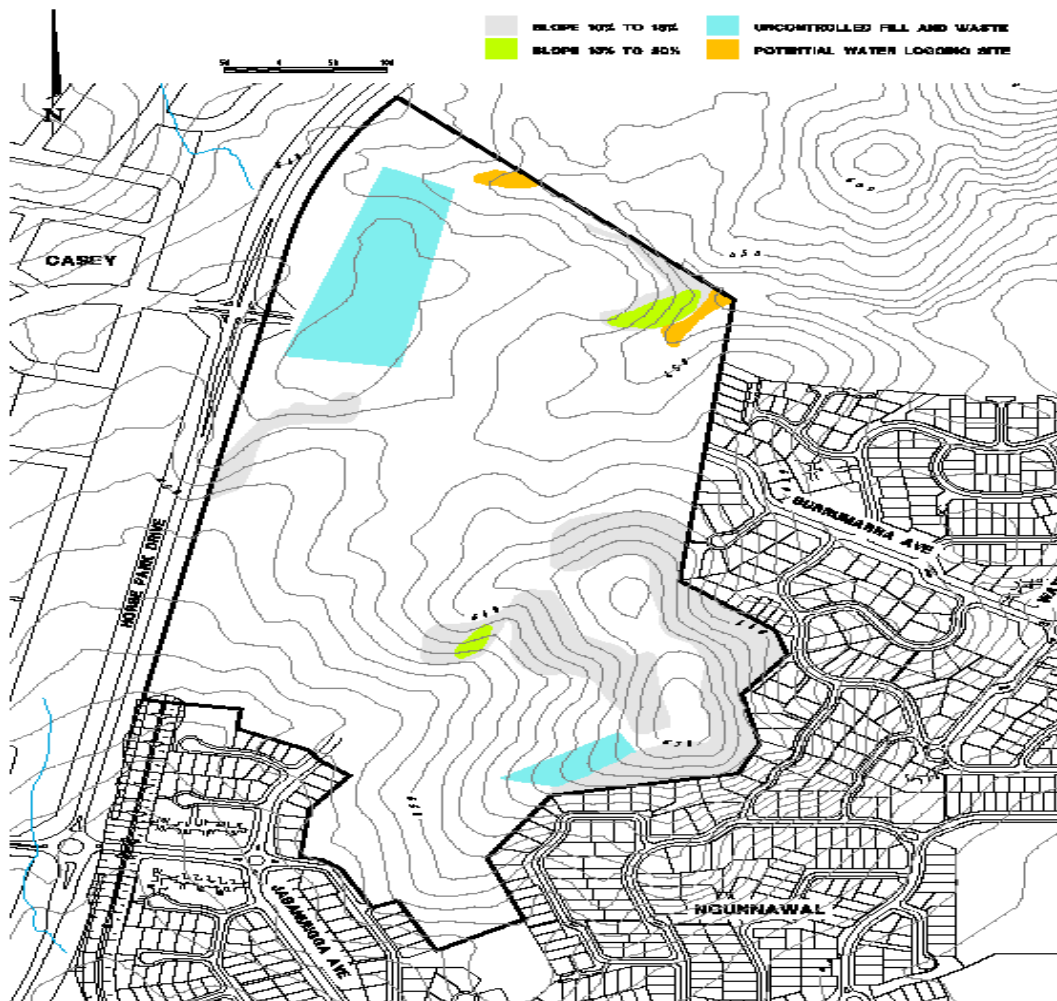
- Uncontrolled fill and waste. The major stockpile is located in the north-west section of the study area (refer Figure 2) and has an estimated size of about 80,000m³.
- Steep ground (>15 percent) in two small areas in the eastern part of the site.
- Potential water logging in two small areas in the northern part of the site.

These geological constraints are shown in figure 5 location of geotechnical constraints.

The basic rock formation is shale and rock outcrops are relatively common. Further detailed geotechnical investigations are to be undertaken as part of the Estate Development Plan.

The uncontrolled fill and waste will be removed prior to the area being developed. Some of the fill material is expected to be used for building Horse Park Drive. The steep ground is very small in area and is largely in open space and is not expected to be a constraint to development. The water logging can be addressed through detailed subdivision and engineering design at development stage.

Figure 5: Location of Geotechnical Constraints



6.5 Contamination Assessment

A phase 1 contamination study has been undertaken by Douglas Partners in November 2007 and has revealed 8 potential areas of environmental concern (PAEC). Further assessment of these areas will need to be undertaken prior to lodgement of an Estate Development Plan or sale of the site.

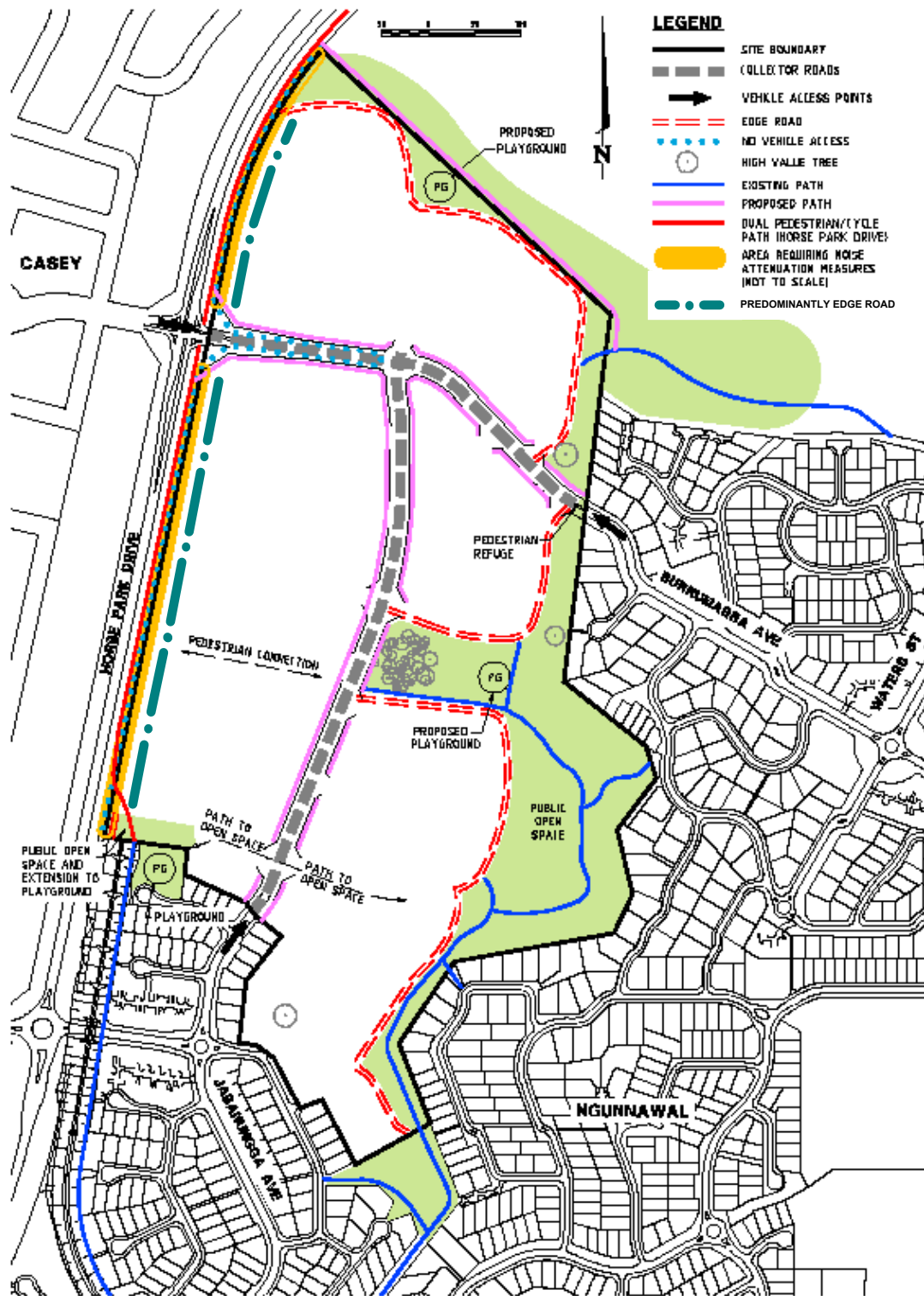
This report has identified that the overall potential for contamination at the site is considered to be low to moderate. The resulting PAEC’s will result in a phase 2 contamination study being conducted prior to development of the area. Once this report has been undertaken and the site remediated (if required), it is considered that the site is suitable for residential development.

All of the above principles are shown in Figure 6 – Important Planning Requirements Plan.

6.6 Bushfire Risk Assessment

A bushfire risk assessment was undertaken in 2006 by Conacher Travers that identified a number of mitigation measures to lessen the risk from bushfires. The estate requires Inner and Outer Asset Protection Zones (IAPZ and OAPZ) to reduce the potential risks by providing a fuel free or fuel reduced buffer separating the “asset” from the bushfire prone vegetation.

Figure 6: Important Planning Requirements Plan



As a result of the modified vegetation, an APZ also contains a fire trail and therefore holds the benefit of providing a strategic location for directing operations by firefighters engaged in the suppression of an oncoming bushfire. This fire trail is intended to generally follow the line of existing informal tracks used as a recreation resource by the local community.

The estate was also subject to further assessment by Australian Bushfire Protection Planners Pty Ltd in October 2007. This review further identified the full potential of the bushfire risk from bushfires/grass fires burning across the undulating land to the north and northwest of Ngunnawal 2C, plus addressed the need for temporary protection against a severe fire event impacting the north-western edge of Ngunnawal 2C, if Ngunnawal 2C commences development prior to Casey. These permanent measures also include a 60 metre home asset protection zone (HAPZ). All dwellings within this HAPZ will need to be constructed to level 1 construction standard in accordance with *Australian Standard (AS) 3959 –Construction of Buildings in Bushfire Prone Areas*.

To enhance the protection provided by the APZ, all future dwellings within the internal 100 metres of the northern, western and north-western boundaries, and the “T” shaped open space area, shall have an external gutter protection shroud or a gutter system that prevents the accumulation of leaves or other flammable material.

The recommendations of this review including the provision of Asset Protection Zones, construction standards and access for firefighting, address the provisions of *Planning for Bushfire Risk Mitigation* and the potential level of risk to Ngunnawal 2C are outlined in Figure 7.

6.7 Heritage

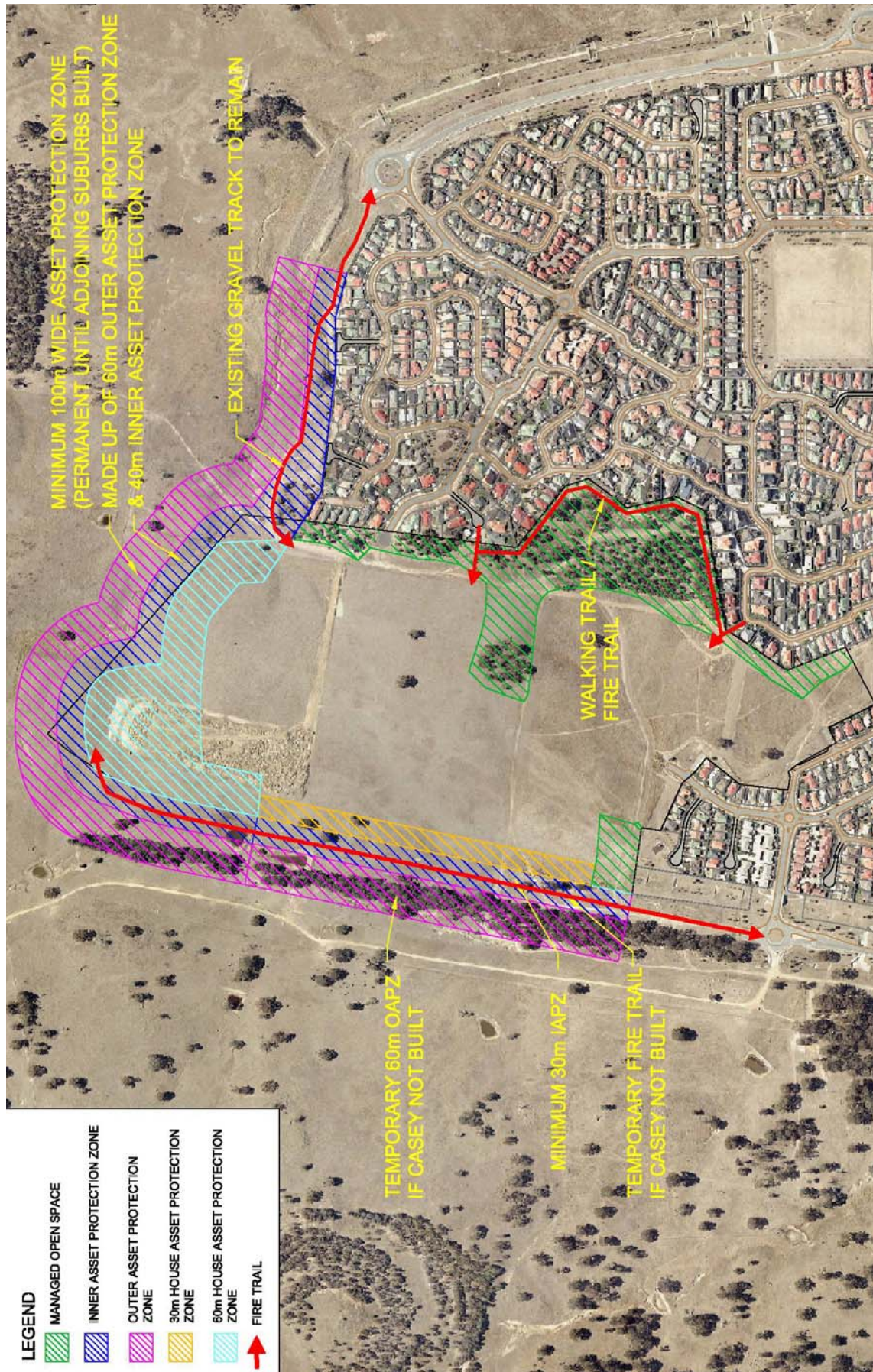
Aboriginal

Five sites were identified in an initial Survey for Archaeological Sites undertaken by Navin Officer Heritage Consultants Pty Ltd in June 2003 and were placed on the interim Heritage Places Register by the ACT Heritage Council under 68(2) of the *Land (Planning and Environment) Act 1991* on 3 September 2004. The sites are summarised as follows:

- N2C1 - An isolated stone artefact located on a vehicle track on a hilltop of low conservation value.
- N2C2 - An isolated stone artefact located on the surface of a graded fire containment line of low conservation value.
- N2C3 - An isolated stone artefact located on a graded surface next to a dirt vehicle track on a ridge top of low conservation value.
- N2C PAD1 - A potential archaeological deposit on a slightly elevated crest overlooking a creek.
- N2C PAD2 - A potential archaeological deposit located on a low knoll to the east of a crest.

Subsequent Salvage Collection and Sub-surface Investigations undertaken by Australian Archaeological Survey Consultants in March 2005 focussed on a program of sub-surface test pitting within the potential archaeological deposits (PADs) plus salvage collection of the isolated artefacts. These artefacts have been lodged with the Heritage Unit. On the basis of these subsequent investigations and consultation with representatives from the three Aboriginal organisations the Heritage study concluded that there are no further archaeological requirements for heritage sites N2C1, N2C2, N2C3, N2CPAD1 and N2CPAD2.

Figure 7: Bushfire Protection Measures



Note: all dwellings within 100m of the N; NW and E boundaries must have external gutter protection

European

There are no items of European heritage significance within the study area.

6.8 Road Network Hierarchy

The main collector roads within the estate will be the extension of Burrumarra Ave to Horse Park Drive and also the extension of Jabanungga Ave to Burrumarra Ave. The major access point to the estate will be from Horse Park Drive at Burrumarra Ave. A low number of trip generations are expected along Burrumarra Ave from the existing suburb of Ngunnawal to the future local centre within Casey.

Road Hierarchy and Functional Classifications

Within the development there are three classifications of roadways, being access streets, minor collector and major collector as outlined in the table below:

Road Hierarchy and Traffic Volumes

ROAD	TRAFFIC VOLUME (VPD)	CLASSIFICATION	PAVEMENT WIDTH	ACCESS RESTRICTIONS
Internal streets	<1000	Access Street B	6m	No
Jabanungga Ave	1,200	Minor Collector	7.5m	No
Burrumarra Ave, east of Jabanungga	1,683	Minor Collector	7.5m	No
Burrumarra Ave, west of Jabanungga	3,345	Major Collector	10.5m (incl 2x1.5m on-road cycling lanes)	Yes

Horse Park Drive is proposed to be a single carriageway arterial road with predicted traffic volumes in the order of 16,800 vehicles per day (vpd) in the section adjacent Ngunnawal 2C.

The existing collector roads (Burrumarra Ave and Jabanungga Ave) are designed to take buses. The extension of these two roads into Ngunnawal 2C will be designed in accordance with current design criteria so that buses will be able to continue through Ngunnawal 2C.

Traffic Assessment

There is currently no traffic volumes on existing roads surrounding the development site.

Once Burrumarra Avenue has been extended to Horse Park Drive it will attract current Ngunnawal residents, particularly those who live in North Ngunnawal. The existing dwellings are anticipated to generate about 970 vehicles per day (vpd).

Some Ngunnawal motorists use Arrabri Street to and from Horse Park Drive. The existing development in this area creates about 1,736 vpd.

The development of Ngunnawal 2c will comprise about 475 dwellings. Using ACT Guidelines for the Planning and design of Residential Estates, will mean approximately 4,750 trips will be generated by this area (about 10 trips per dwelling).

Reference is made to table 1 above with regard to internal traffic volumes. The main collector roads will link into Horse Park Drive and will be designed to relevant standards.

Access Points

Vehicular access points will be from Burrumarra Ave to the east, with a link to the future extension of Horse Park Drive, and Jabanungga Ave to the south.

The primary access to the development from Horse Park Drive will be at a 4 way intersection which also services Casey and extends to new suburbs such as Taylor and Moncrieff. This intersection is proposed to be a signalised intersection to assist safer pedestrian movement due to the proposed location of the Casey local centre and future Casey residents accessing the Ngunnawal Primary School.

Signalisation will only be required when Horse Park Drive is extended further north from the intersection with Burrumarra Avenue. In the interim it is planned that a 4 way intersection be constructed with the northern and western legs closed. This would act as a 90 degree turn into Ngunnawal 2C and would not require signalisation. When Casey is developed the western leg of the intersection would be opened and would act as a T intersection also not requiring signalisation and would allow for pedestrian access.

Public Transport

Potential bus route will run along Horse Park Drive. Provision of bus stops will be required to ensure dwellings are located within 400m of a bus stop.

The extension of Jababunnga Ave (the north-south collector road) is unlikely to be required for a bus route. The design of the Jabanungga Avenue extension as a collector road will ensure allowance is made for possible public transport links if required in the future.

The pedestrian networks (whether on-street or off-street) should provide for direct (north-south) links to the bus stops on Arrabri St and Burrumarra St.

Pedestrian & Cycle Network

Pedestrian footpaths are to be provided along all local streets and on both sides of the two collector roads. Provision for on-road cycling will also be provided for in the two collector roads.

In accordance with the Draft Gungahlin Cycleway Master Plan, on-road cycling lanes are proposed in Horse Park Drive. This on-road lane is additional to the off road cycle/pedestrian path to be located in the Horse Park Drive road reserve that will be an extension of the existing path located adjacent to the existing stormwater drain to the south-west of the estate.

Paths within the estate are to connect with this path network within Horse Park Drive. The Bicentennial National Trail (horse riding trail) currently traverses the study area and generally follows the existing urban edge. This trail will need to be relocated prior to any construction works to ensure amenity for riders as well as minimises potential conflicts between users, for example dog walkers and horse riders.

Traffic Noise

Future dwellings in Ngunnawal 2C within 60m of the edge of the Horse Park Drive pavement will likely experience traffic noise levels slightly above the 58dB(A) LA10(18hr) standard set for private open space in *(Draft) Noise Management Guidelines 1996*.

To mitigate this, sound attention measures are required and two options are feasible:

1. a 1.2m earth mound along Horse Park Drive within the road reserve, or
2. a 1.8m high lapped and capped fence along the boundary of Horse Park Drive road reserve.

Either of these measures will reduce the predicted noise levels within the private open space of future dwellings to below the standard. The mound or fence will need to include breaks, in locations not adjacent to future dwellings, to maintain pedestrian and cycle connections to the path network adjacent to Horse Park Drive. Noise attenuation measures along Horse Park Drive will need to occur within or immediately outside the road reserve, subject to the resolution of Horse Park Drive and associated works.

Equestrian Trails

The Bicentennial National Trail (horse riding trail) currently follows the existing urban edge as shown by figure 8.

This trail will need to be relocated prior to development commencing to ensure amenity for riders as well as minimises potential conflicts between users.

Figure 8: Location of Bicentennial National Trail



Red dashed line shows the interim location of the Bicentennial National Trail

6.9 Engineering Services

Water Supply

Ngunnawal 2C will be serviced from the high water supply zone. In order for this to occur a number of infrastructure elements are required including the Kinlyside Reservoir and associated feeder and distribution mains. Once the high water supply zone is on line a connection will also be made to the existing reticulation network in Ngunnawal, in order to increase water pressure in this area and replace an existing temporary pump station.

There is an existing 450mm diameter (dia) water main adjacent to Horse Park Drive. This main will be extended through Casey to run parallel to Horse Park Drive to the future intersection with Burrumarra Ave. A 225mm dia branch from the 450mm dia supply main will need to extend east across Horse Park drive into Ngunnawal 2C and connect to the exiting system in Ngunnawal. Reference is made to Figure 9 with regard to all Engineering Services.

Further components of the water supply network required include:

- Pump station connected to the existing 450mm dia main to supply water to the Kinlyside Reservoir (both located within Casey).
- 225mm dia distribution main through Ngunnawal 2C with a link to the existing system within Ngunnawal.

Sewerage

The majority of Ngunnawal 2C will drain to the south west corner of the estate. The existing sewer network within Ngunnawal provides a number of suitable connection points. The majority of flows will be directed to the 225mm dia sewer main adjacent to Horse Park Drive. All flows from the south east corner of the estate, divided by the main north south collector road (extension of Jabanungga Ave), will be directed to existing stub connections contributing to the Ngunnawal sewer network.

The northern catchment within the estate will be serviced via a connection to the existing trunk main at the northern boundary of Ngunnawal. This connection will utilise an existing 225mm dia stub that was intended to service the future Ngunnawal Group Centre. Under the latest North Gungahlin Structure Plan this area has been designated for residential development, however the stub will still be utilised.

Stormwater Drainage

The majority of the estate drains from the ridge along the eastern side to the south west via a series of natural overland flow paths. The current network of existing stormwater drainage infrastructure includes a major engineered floodway adjacent to Horse Park Drive. All overland flows and pipe drainage from the southern catchment will be directed to this floodway.

In order to capture the stormwater flows from Horse Park Drive and Casey, the floodway is also proposed to follow an existing watercourse which will be piped under Horse Park Drive and proceed along the eastern side of Casey. The works for Horse Park Drive will be included as capital works for that project and the works within Casey will be part of that development. Any noise attenuation measures such as noise mounds within this area will need to be incorporated into the Horse Park Drive road reserve area.

The northern catchment currently drains to the existing creek to the north of the site. Development proposed along the northern boundary of the site should take into account the requirement to be above the ARI 100 year flood level at this location.

The eastern edge of the site, adjacent the open space corridor will require catch drains at the edge roads to provide protection from the minor flows expected from the grassy ridge.

Water Sensitive Urban Design (WSUD)

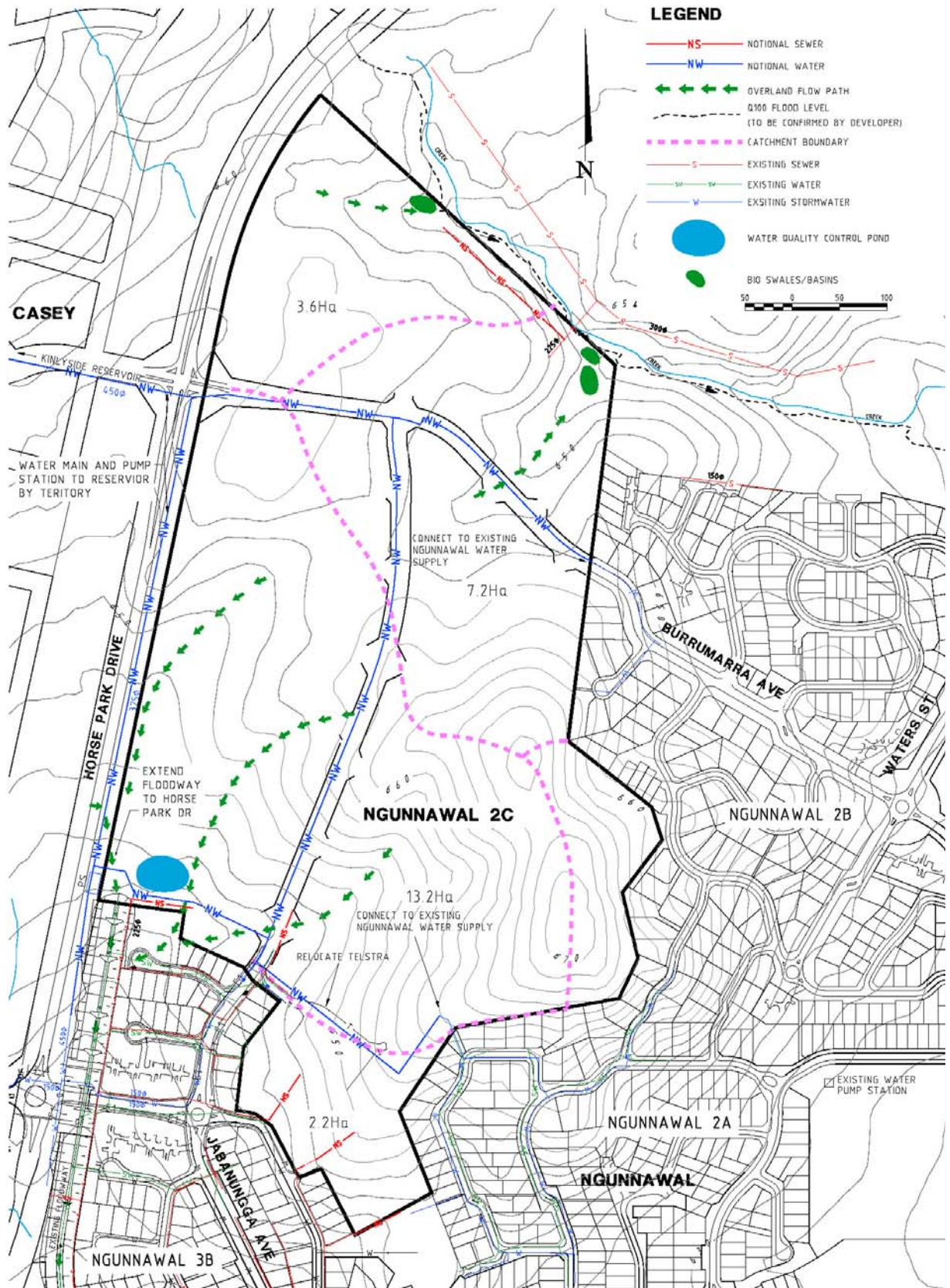
The surrounding areas within Ngunnawal do not have any elements of infrastructure that are based on WSUD principles. In order to meet ACT Government sustainable development guidelines, *Water Ways: Water Sensitive Urban Design General Code*, the following WSUD treatments are to be included in this development:

- Water quality control pond and wetland at the downstream end of the south west catchment;
- Bio swales and bio retention basins in the northern catchments;
- Swale drains at edge roads where gradients are suitable;
- Direct runoff from edge road surfaces to open space areas;
- Possible infiltration zones at street trees in the western section of Burrumarra Ave (in conjunction with entry statement);
- Rainwater tanks on blocks; and
- Any other requirement as specified in *Water Ways: Water Sensitive Urban Design General Code*.

Other Infrastructure

Telecommunications infrastructure currently exists at both the Jabanungga Ave and Burrumarra Ave connection points. These services will be extended throughout the estate as necessary in accordance with the relevant standards.

Figure 9: Engineering Services



6.10 Dwelling Numbers and Housing Mix

The area of the site with development potential (excluding public reserves) has an area of approximately 33ha. The North Gungahlin Structure Plan established a desired dwelling yield of 13 dwellings per hectare for the single dwelling sites and 20 dwellings per hectare for the multi unit sites. This would provide an average dwelling yield over the whole site of 14.5 dwellings per hectare which would result in 475 dwellings.

The following housing mix is considered appropriate for the Concept Plan:

- Medium density housing near the intersection of Burrumarra Avenue and Horse Park Drive and adjacent to parks.
- Smaller blocks in the northern part of the study area, north of Burrumarra Avenue and adjacent to the areas of medium density housing.
- Standard blocks on the balance of the area.
- The location of compact housing blocks to be provided in accordance with the ACT *Compact Block Housing for New Estates: Interim Territory Plan Guideline* August 2007.

It is intended that the achievement of the housing mix also include a proportion of “affordable housing” product in accordance with the ACT *Affordable Housing Strategy*.

Aged Persons Accommodation

Two sites for Aged Persons Accommodation have been identified by the ACT Government in the general locality. Block 9 Section 78 Nicholls, was the subject of a Preliminary Assessment in 2005 and is soon to be released for development. In addition, Blocks 1 & 2 Section 23 Ngunnawal (Gold Creek Homestead) is the subject of a draft Variation to the Territory Plan to facilitate Aged Care development on the site.

Both sites are approximately 1.0 - 1.5km south of the study area and will meet future demands for Aged Persons accommodation within this part of Gungahlin. As such, it is not intended to specifically allocate a site within the estate for Aged Persons Accommodation.

6.11 Services and Facilities

Commercial Centres

Local shopping facilities are located in Ngunnawal approximately 1km from the site. A future local centre is proposed to be located at the northern end of the adjoining suburb of Casey and it is likely that this local centre will service future residents of Ngunnawal 2C. No new retail facilities within the estate are proposed.

Community Facilities

There are no proposals to provide community facilities on the subject site, other than public open space and children’s playground areas.

Community facilities are located in Ngunnawal adjacent to the local centre, in Nicholls as well as future facilities in the Casey group centre. The nearest education facilities include (approximate distances):

FACILITY	LOCATION	DISTANCE
Pre-school	Ngunnawal	500m
Primary school	Ngunnawal	500m
High School	Gold Creek High (Nicholls)	1.2km
College	Copland College (Melba)	6.5km
Tertiary Education	University of Canberra, CIT (Bruce)	9km

7. WORKS ASSOCIATED WITH DEVELOPMENT

7.1 Capital Works

The following Capital Works projects are required to be completed prior to occupation of Ngunnawal 2C. These are:

- Kinlyside Water Supply Reservoir

It is proposed that a 6.4ML reservoir be constructed to the north west of Casey and be operational by September/October 2009, to supply the future development within Ngunnawal 2C and Casey.

The supporting works required to bring this reservoir online include a pump station and 450mm dia rising main to the reservoir in Casey, and a 375mm dia supply main to the northern boundary of Ngunnawal 2C.

- Horse Park Drive

The extension of Horse Park Drive will be required to provide a direct access point to the northern part of the estate. It is proposed that the road will be constructed to the Burrumarra Ave intersection and the remainder of the earthworks up to the proposed floodway will also be completed. Once completed, this road network can also be used by existing Ngunnawal residents. These works will include works to extend the floodway under Horse park Drive.

The construction of Horse Park Drive is expected to use some of the 83,000m³ of stockpiled fill material from the Ngunnawal 2C site. The balance of the stockpile will be removed prior to commencement of works within the estate.

- Traffic Noise Attenuation Measures

These works depend upon the outcomes of further works/discussions associated with required traffic noise attenuation measures along Horse Park Drive. If a mound and associated works are required, these works will be required within the Horse Park Drive Road Reserve. If fencing and associated works is required, these works will have to be within the Ngunnawal division boundary and completed by the developer.

7.2 Off Site Works

Off Site Works required for the development include the following:

- Stormwater drainage connections to the upstream end of the existing floodway.
- Stormwater drainage connections to the new floodway extension across Horse Park Drive.
- Road and services connections to Horse Park Drive.
- Adjustments to the existing creek at the northern edge of the estate for flood protection.
- Services connections to Jabanungga Ave, Burrumarra Ave and Warabin Cres.
- Footpath/cycleway connections to Horse Park Dr and existing paths in Ngunnawal.
- Implementation of Bushfire Risk Assessment mitigation measures.

8. FURTHER INVESTIGATIONS

Prior to the development of the estate, further detail investigations are required to be undertaken that are beyond the scope of the Concept Plan. These are detailed below.

- Final Tree Management Plan is to be prepared for consideration by Tree Protection Unit TAMS. A further tree assessment and survey is required ahead of the land release.
- A detailed Phase 2 Contamination Assessment Report should be prepared for the site.
- Water Sensitive Urban Design measures adopted within the site should be investigated in detail to determine that the measures proposed do not adversely affect any other infrastructure or private property, prior to finalisation of the road and block layout for incorporating into the development documentation.
- Traffic noise attenuation measures along Horse Park Drive/Ngunnawal 2c boundary to be resolved.