Godden Mackay Logan
Heritage Consultants

Bungarribee Homestead, Doonside
Former Kitchen Gardens

Archaeological Assessment and Research Design

Report prepared for Landcom

May 2008

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Report Register

The following report register documents the development and issue of the report entitled Bungarribee Homestead, Doonside Former Kitchen Gardens—Archaeological Assessment and Research Design, undertaken by Godden Mackay Logan Pty Ltd in accordance with its quality management system. Godden Mackay Logan operates under a quality management system which has been certified as complying with the Australian/New Zealand Standard for quality management systems AS/NZS ISO 9001:2000.

Job No.	Issue No.	Notes/Description	Issue Date
08-0190	1	Draft Report	22 May 2008
08-0190	2	Final Report	30 May 2008

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1.0 Introduction

1.1 Background

Godden Mackay Logan (GML) has been engaged by APP Corporation Pty Ltd (on behalf of Landcom) to:

- undertake an assessment of the potential for, and research significance of, historical (non-Aboriginal) archaeology at the site of the former kitchen gardens in the vicinity of Bungarribee Homestead, Doonside; and
- prepare an Archaeological Research Design that establishes an appropriate methodology for the investigation and management of the potential archaeological resource, in the event that consent is granted for the proposed subdivision without a requirement for the former kitchen gardens areas to be maintained as open space.

Landcom proposes to develop the site of the former kitchen gardens as part of a broader program of development of the 'Doonside Residential Parcel'. Figure 1.1 shows the location of the Doonside Residential Parcel and Figures 1.2–1.3 illustrate the Concept Layout Plan for the proposed subdivision and proposed future uses.

Most of the Doonside Residential Parcel is located within the boundaries of the State Heritage Register (SHR) listing for the Bungarribee Homestead Complex (Archaeological Site). Figure 1.4 shows the extent of the SHR listing.

The proposed development of the Doonside Residential Parcel has been declared a 'major project' by the Minister for Planning, to be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Therefore, although the site of the former kitchen gardens falls within the SHR boundaries of the Bungarribee Homestead Complex, the provisions of the *Heritage Act 1977* do not apply and no application to the Heritage Council is required prior to commencement of works pursuant to Section 60 of that Act.

GML has prepared the following heritage reports for the Bungarribee Homestead Complex:

- Doonside Residential Parcel, Western Sydney Parklands Conservation Management Plan (May 2007); and
- Doonside Residential Parcel and Parklands—Bungarribee Precinct, Western Sydney Parklands Heritage Impact Statement (August 2007).

The above reports included a detailed site history and assessment of archaeological potential and significance. The Heritage Impact Statement (submitted with the Concept Application for the redevelopment) included recommendations for the management of the archaeological resource generally. However, the above reports did not include a consideration of the former kitchen gardens, which subsequent research has demonstrated to be likely to exist to the north of the homestead complex (see Figure 3.1 which shows the likely location of the garden relative to the proposed development).

This Archaeological Assessment and Research Design specifically addresses the potential relics that may exist at the site of the former kitchen gardens and assesses their significance. It includes

recommendations for the future management of the archaeology of the former kitchen gardens based principally on their assessed research values.

Section 2.0 of this report reproduces the site history contained in the 2007 HIS prepared by GML. Section 3.0 presents the results of subsequent research into the nature and extent of the former kitchen gardens. The balance of the report provides a management regime for the archaeological resource based on its assessed significance.

The report concludes that there is low-to-moderate potential for archaeological relics to survive, deriving from the former kitchen gardens, depending on the type of relic. Those relics would be significant for their value as a research resource. Although the proposed development of the site would result in the disturbance and/or destruction of large parts of the garden, the adverse heritage impacts that this would cause can be mitigated by the archaeological investigation of the site prior to commencement of the development works.

1.2 Limitations

This Archaeological Assessment and Research Design does not deal with the potential Aboriginal archaeological resource.

1.3 Author Identification

This report was prepared by Dr Andrew Sneddon, Senior Consultant, of GML, and reviewed by Prof Richard Mackay, AM, Partner. Dr Andrew Fairbairn, Department of Archaeology, University of Queensland, provided input with respect to botanical analysis methodologies.

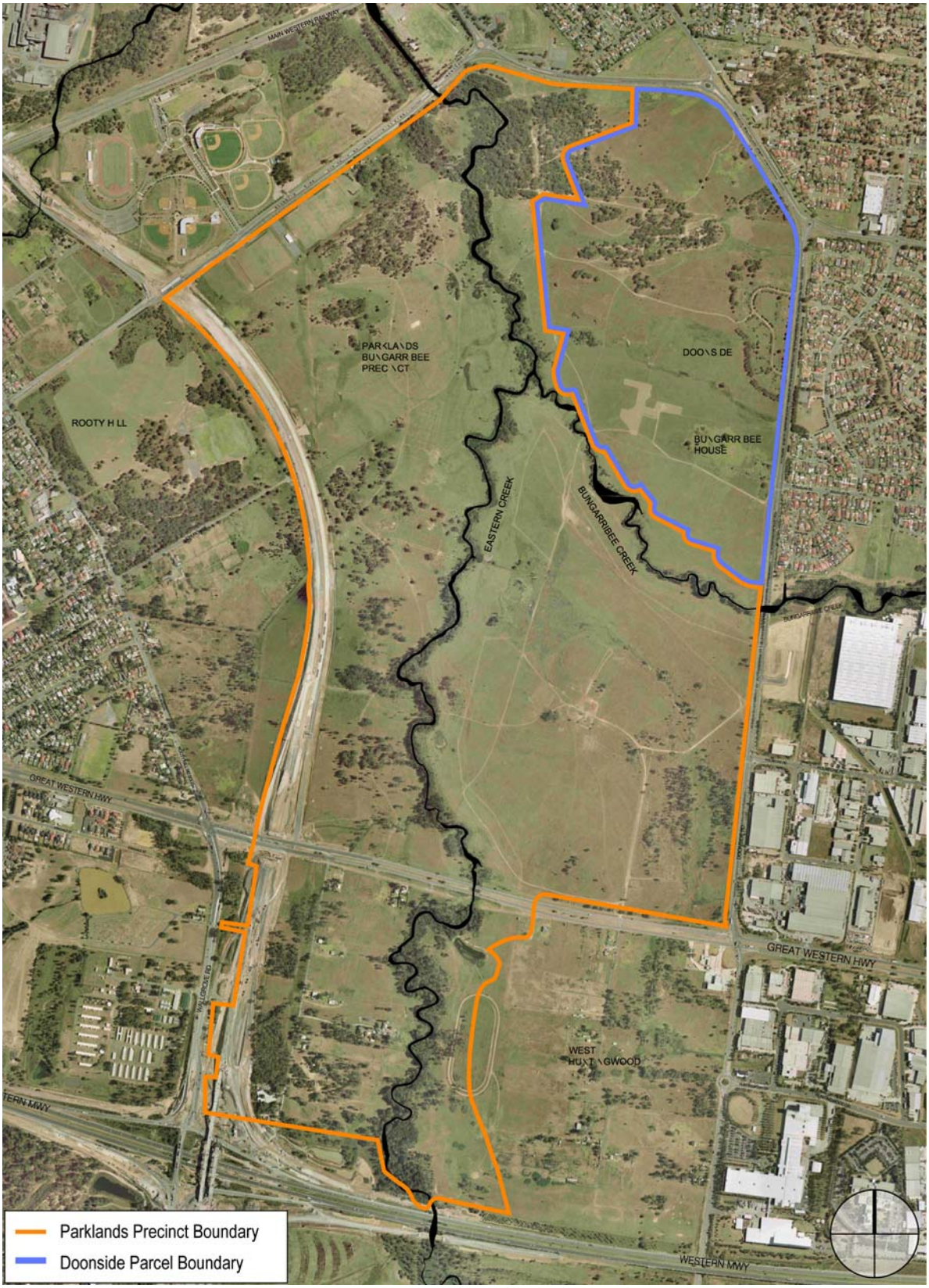


Figure 1.1 Aerial view of the Western Sydney Parklands area showing the location of the Doonside Parcel and the Parklands Precinct.

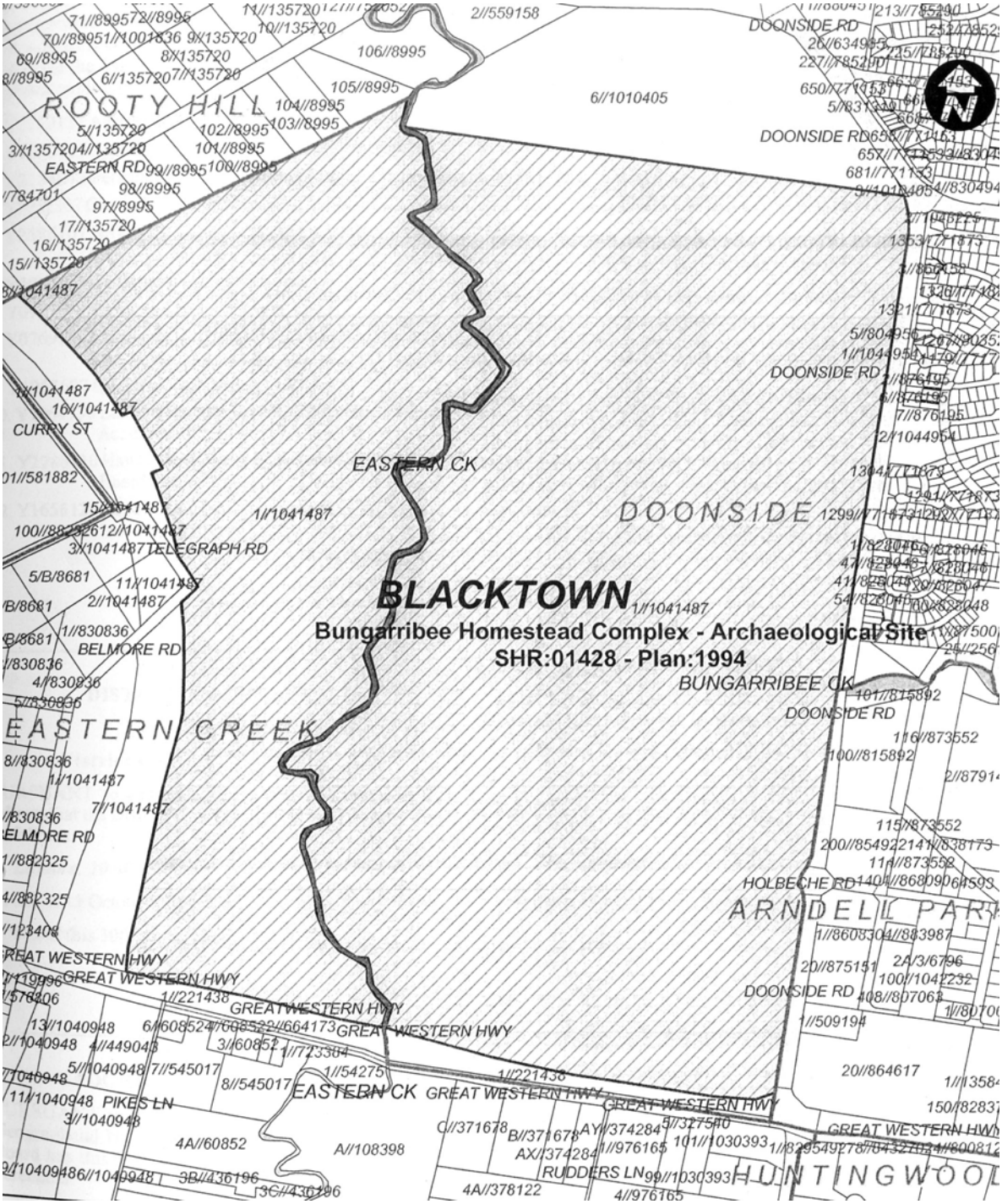


Figure 1.2 Plan showing the SHR boundary and listed area (hatched) for the Bungarribee Homestead Complex—Archaeological Site. (Source: NSW Heritage Office)

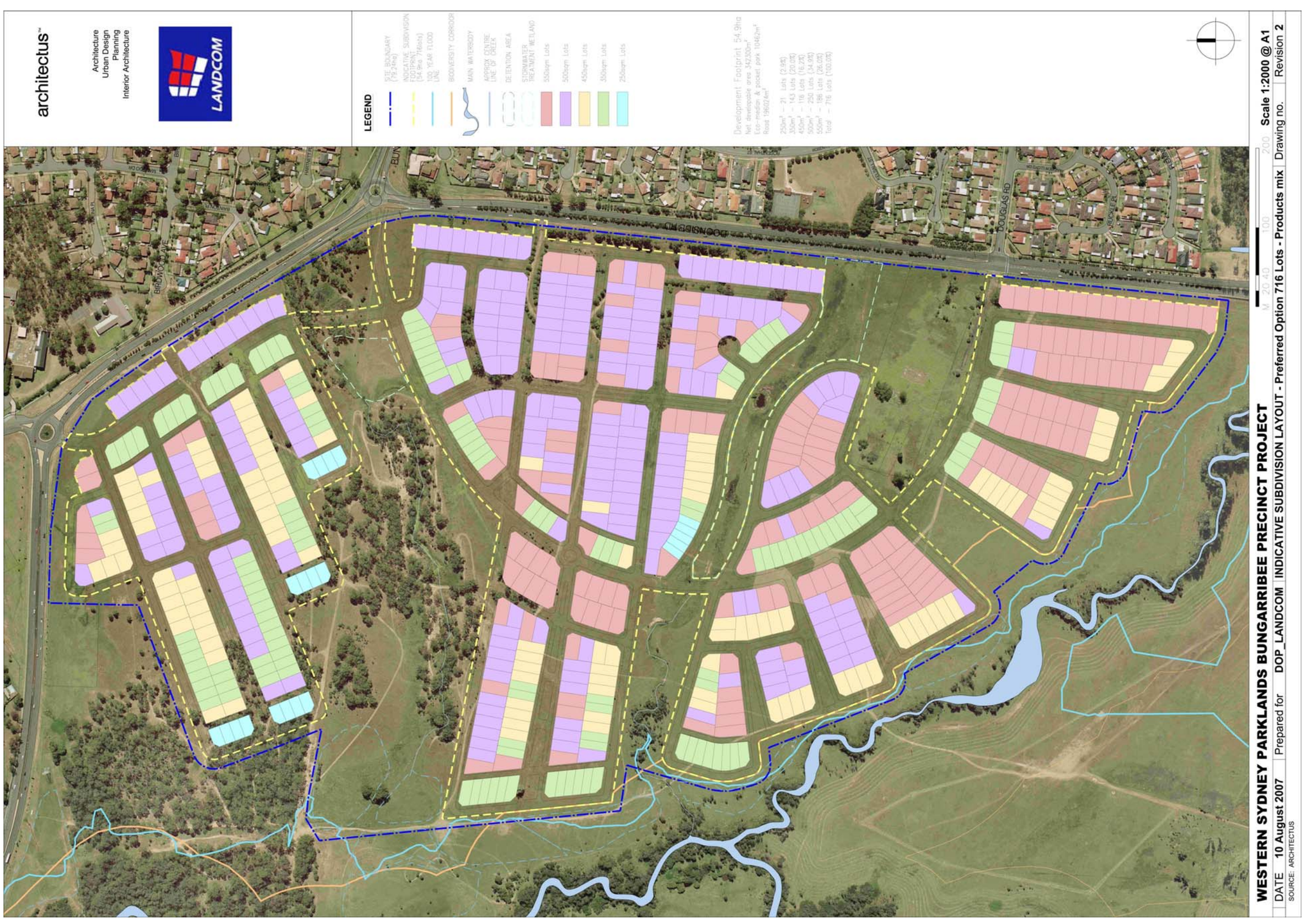


Figure 1.3 Proposed Concept Layout Plan showing the proposed subdivision of the Doonside Parcel.

Figure 1.4 Proposed Concept Layout Plan showing the future use of the Parklands Precinct.

2.0 Historical Themes

2.1 Preamble

The Bungarribee House site and farm estate, of which the Doonside Parcel is a part, has a layered history reflected in a variety of physical and intangible elements. It embodies a range of values which vary in their levels of significance and in their tolerance to change.

This section of the HIS summarises the historical themes and heritage values of the wider Bungarribee House site and farm estate, including the area of the Doonside Parcel and Parklands Precinct, and provides a brief historical overview of the area's development. A more comprehensive history and heritage significance assessment of the Bungarribee House site and farm estate including the Doonside Parcel and its core heritage area, is discussed in the Doonside Parcel Conservation Management Plan (CMP) prepared May 2007 (CMP 2007) by Godden Mackay Logan.

The history of the former Bungarribee House site and farm estate is divided into three main historical phases:

- Phase 1—Pre-Bungarribee Estate including the Government Farm (1801–1823).
- Phase 2—The Bungarribee Farm Estate (1823–1949).
- Phase 3—Post-Bungarribee Uses (1849–present).

Each of these phases is represented to varying degrees in the archaeological and landscape resources of the Doonside Parcel and Parklands Precinct, but particularly in the Core Heritage Area.

2.2 Historical Themes

The *NSW Heritage Manual* provides a set of Historical Themes relevant to New South Wales that provide a historical context within which the heritage values of a place can be examined. A number of the themes are relevant to the Bungarribee House site and farm estate, of which the Doonside Parcel is part. They are summarised in the following table.

Theme	Explanatory Note	Comment
Aboriginal Culture	Activities relating to maintaining, developing, experiencing and remembering Aboriginal cultural identities and practices, past and present.	The Bungarribee House site and farm estate was within the traditional area of the Warrawarry people who utilised the river, forests and grasslands for food and shelter. Interactions between Aboriginal people and European settlers occurred in and around the estate during the colonial period.
Convict	Activities relating to incarceration, transport, reform, accommodation and working during the convict period in New South Wales (1788–1850).	Embodied in the archaeological remains and intangible features dating to the Convict Phase of the site's use.
Agriculture	Activities relating to the cultivation and rearing of plant and animal species, usually for commercial purposes.	Embodied in the archaeological remains of farm outbuildings, the surrounding rural landscape, stockyards and fence lines on the property.

Theme	Explanatory Note	Comment
Environment (Cultural Landscapes)	Activities associated with the interactions between humans, human societies and the shaping of their physical surroundings.	The land clearing associated with the colonial use of the site and subsequent farm uses created a distinctive rural landscape. Garden plantings around the house dating from the nineteenth century still survive.
Pastoralism	Activities associated with the breeding, raising, processing and distribution of livestock for human use.	The Bungarribee House site and farm estate was associated with the breeding of race horses and military horses throughout the nineteenth century. It was famous as a racing stud, with many winners sired on site. The farm was also used for the raising of dairy and beef cattle and sheep until the 1940s. The surrounding district was also characterised by small farms, orchards and rural holdings.
Land Tenure	Activities and processes for identifying of ownership and occupancy of land and water.	Embodied in the remaining fence lines that mark the boundaries of the estate and of the surrounding small farm sites that remain in the Parklands.
Accommodation.	Activities associated with the provision of accommodation, and particular types of accommodation.	The Bungarribee House site and farm estate contained a number of accommodation buildings of differing types and uses, including a grand colonial residence, servants quarters, convict barracks, farm workers dormitories and converted barracks for soldiers of the East India Company.
Domestic Life	Activities associated with maintaining, promoting, living in and working around houses and institutions.	The archaeological remains of a main residence, domestic servant quarters and convict barracks embody the division of accommodations and labour on a colonial estate.
Industry	Activities associated with the manufacture, production and distribution of goods.	The Bungarribee House site and farm estate included a blacksmith and carpentry shops for use on the estate and later a boiling down and tallow works. To the south, small rural and associated industries were also located at Eastern Creek village and on surrounding farms.
Labour	Activities associated with work practises and organised and unorganised labour.	The Bungarribee House site and farm estate employed a large work force of convict labourers and later kanak indentured labour and free workers throughout its working life as a farm.
Defence	Activities associated with defending places from hostile takeover and occupation.	During World War II, the Bungarribee House site and farm estate was resumed for use as a military airfield.
Government and Administration	Activities associated with the governance of local areas, regions, the state and the nation, and the administration of public programs.	The Bungarribee House site and farm estate represents some of the earliest settlement in the colony of New South Wales. Its role as an experimental farm, the developing use of convict labour, its resumption by the military and final resumption by OTC, represent ongoing stages in the governance of the local area, region, state and nation.
Communication	Activities related to the creation and conveyance of information.	The Bungarribee House site and farm estate was resumed by the OTC for the development of a radio transmitting station.

Theme	Explanatory Note	Comment
Towns, suburbs and villages	Activities associated with creating, planning and managing urban function, landscapes and lifestyles in towns, suburbs and villages.	The site of the Eastern Creek village on the Great Western Highway represents the growth of a small community around road side inns serving travellers during the nineteenth century.

2.3 Historical Overview

2.3.1 Rooty Hill Government Farm

The Doonside Parcel and Parklands Precinct were both within the larger site of the Rooty Hill Government Farm, an area of 38,728 acres (387.28 ha). The Rooty Hill farm had been established by Governor King as a means to ensure ongoing supply of good pasture for government herds, as well as land for cultivation of crops and produce. King saw the farms (there were four large farm sites in the Sydney area in total) also as a way to keep the fledgling colonial economy out of the exclusive hands of profiteers and market manipulators.[1]

The farm runs were left largely unaltered from their natural state, save for an overseers hut and scattered huts for convict shepherds and labourers, as well as stockyards and fences to enclose grazing areas. At Rooty Hill much of the development was largely to the northwest of the Doonside Parcel and Parklands Precinct boundaries, although fencing may have been erected throughout the two precincts.

By the time of the arrival of Governor Macquarie in 1810, the demands of private landholders and settlers was growing to the point that Macquarie began to subdivide lots from the government farms. Macquarie also believed that the worst was over for the colony in terms of food production and that the need for the large government farms to supply the colony was no longer s pronounced.[2]

From c1815, Macquarie began to grant parcels of land from the Rooty Hill farm to settlers, which marked the beginning of organised European agricultural activity in the area.

2.3.2 Bungarribee House and Estate 1825–1950

The largest portion within the Doonside Parcel and Parklands Precinct was that of John Campbell's 2000 acres which he took up in c1822 (see Figure 2.1). Campbell's estate was bounded in the west by Eastern Creek, in the north by the current Bungarribee Road (and its line west of Doonside Road), in the south by the Great Western Highway and the east by the approximate line of Reservoir Road (beyond the study area). Campbell, who had emigrated with his family from Scotland, erected a temporary residence on the high point of his land and began to clear and cultivate, with the help of 22 convict labourers. By the census of 1822, Campbell was recorded as having 130 acres cleared, 15 acres of wheat, five acres of barley and two acres of potatoes. His stock included 24 head of cattle, 28 hogs and one horse. It also notes that he had six convicts for six months victualling from the government stores, and had applied for five mechanics and four labourers.[3]

Campbell's temporary residence was enlarged in 1825 and incorporated into his new grand home. Campbell positioned his new house on the top of the highest hill on the property, with the main living section facing to the west, providing views to the Blue Mountains in the distance. Situated on the highest point, the house was clearly visible to travellers passing along the Western Road and in time it became a landmark in the area.[4] (Although now demolished, the site retains its landmark qualities through the Bunya pine (*Araucaria bidwillii*), Hoop pine (*Araucaria cunninghamii*), Mediterranean cypress or pencil pine (*Cupressus sempervirens*), Port Jackson fig (*Ficus rubiginosa*) and Peppercorn tree (*Schinus*

areira) that remain on the site and are visible from Doonside Road and were part of the Bungarribee House garden).

As well as the house, a number of large outbuildings and farm structures were erected on the raised area, including a brick convict barracks, a large brick barn, a number of stables, blacksmiths shop, carpenters shop and other associated buildings (see Figure 2.2).

Campbell and his family only lived at Bungarribee for five years, with his wife Annabella dying at the house in 1826 and Campbell in 1827. Their short period of residence was a harbinger of things to come, with a most of the nineteenth century residents living there for less then ten years each.

Another commonality was that many of the residents of Bungarribee were prominent colonial figures, including Thomas Icely (1827–1832), a local magistrate and one of the founders of Australia's race horse breeding industry, Charles Smith (1832–1840) a thoroughbred horse breeder, the East India Company (c1843–1846), which used the property as a remount depot for horses being shipped to India for the British cavalry, and Benjamin Boyd (1846–1851), the prominent colonial merchant and entrepreneur. Boyd used the convict barracks for a period as accommodation for South Pacific (kanaka) labour he had working on his properties.[5]

In 1858 the property was purchased by John Cleeve who lived and farmed on the estate until 1890. Between 1890 and the beginnings of World War II, the estate passed through a number of hands, all of whom used the site for livestock breeding and grazing, a use it had been consistently employed for since it was first established.

In c1941, the Bungarribee estate, excluding the house, as well as properties adjoining the estate, was resumed by the Commonwealth for use by the military. The house and land to the east of Eastern Creek (which bisects the property north–south) remained in the possession of the last private owner of the site, Thomas Cleaver (1929–1950).

The military's interest in the site was for the construction of an airfield to serve as a training site and as an overshoot runway for the nearby Schofields airbase. A runway was constructed of compressed gravel with aircraft hides and taxi ways to the south. The runway extended on the southern side of Bungarribee Creek, in a southwesterly direction from close to the junction of Eastern and Bungarribee Creeks, crossing Doonside Road and ending near McCormack Street (Arndell Park), approximately 1.8km in length.

2.3.3 OTC Occupation

Following the war's end, the estate remained in Commonwealth ownership, with the Cleaver family continuing to run dairy cattle on the northern portion. In 1949, however, the site was vested in the newly formed Overseas Telecommunications Commission (OTC) for the establishment of a new international transmitting station (see Figure 2.3).

The OTC occupied the Bungarribee Estate from 1949 until c2001, although the station ceased operations during the 1990s. The development of the OTC site involved the building of a modern two-storey transmitting station to the south of Bungarribee Creek (in the Parklands Precinct) and the erection of a series of aerials across the entire land holding for transmitting of radio signals. The new OTC station was accessed via the Great Western Highway, west of Doonside Road. The OTC Transmitting Station was officially opened by the Postmaster-General in February 1957.[6]

To the north of the Bungarribee House site, on Doonside road, an area was also developed for staff housing, with a curving access road, street plantings and dwelling houses. The staff housing was

designed by the prominent architectural firm Hennessy, Hennessy & Co, which OTC had commissioned for the housing and the Transmitting Station (as well as the Receiving Station and accompanying accommodation located at Bringelly).

In 1957, OTC proceeded with the demolition of Bungarribee House and most of its remaining outbuildings. The house by this time had not been occupied for a number of years and was deemed to be beyond repair. Despite some local opposition and a campaign by the fledgling National Trust for its retention and restoration, the house was demolished. The only structure to survive was the two storey brick barn, which OTC used for storage. However, this was also demolished in 1977 following its damage in a severe storm.[7]

By the 1990s, telecommunication technology had surpassed the need for radio transmitting and the OTC site was closed. The station buildings and aerial masts had been removed by 2001.

2.3.4 Occupation of the Remaining Parklands

Unlike the Bungarribee estate, the remaining grants and farms within the Parklands Precinct were considerably smaller in size, the largest being 100 acres. These smaller farms were largely granted to emancipist farmers such as William Dean, who was granted (or purchased) three separate parcels (one of 100 acres, the other two being of 50 acres each), opposite each other on either side of the Western Road (see Figures 2.4–2.6). Each of the grants were excised from the Rooty Hill government farm area. Dean built a dwelling and road side inn on the southern side of the Western Road, catering for an increasing trade as lands to the west were settled. As it was approximately a seven hour ride from Sydney town to Dean's Inn (initially called the Bush Inn, later changed to The Corporation Inn) at Eastern Creek, it developed into a popular stopping place.[8]

A toll house was also constructed on Dean's land in 1818 to collect tolls from travellers on the Western Road for upkeep and extension of the road system. The toll house was later repossessed by Dean in the 1840s. Its exact location has not been determined for this study, but previous studies identified it as being opposite to Dean's Bush Inn, close to the junction of Belmore Road and the Western Road.[9] As well as the toll house, Governor Macquarie ordered a small barracks building, known as the Garrison, to be erected on the Western Road at Eastern Creek. The Garrison was built on the northern side of the Western Road on Dean's 50 acres, with Dean being given the equivalent value in cattle for the site.[10] The Garrison was built to house a small party of soldiers including officers and convict work parties employed on the Western Road and the surrounding area. It was likely linked to the Rooty Hill farm site (from which the land had been previously alienated). The Garrison was also later reclaimed by Dean and converted into the family house, 'Hollinsworth', which was occupied by Dean's extended family and descendants until its demolition for the widening of the Great Western Highway during the 1960s.[11]

The Garrison/Hollinsworth site is visible on a 1943 aerial photograph of the site. The photo shows a large house on the north side of the Great Western Highway with a yard and outbuildings to the rear. Opposite the building, on the southern side of the road, is what appears to be a cleared building site, which may be the site of the former Bush/Corporation Inn. Close to the Garrison site, a large brick domed cistern, or well, remains (see Figure 4.22). The well could date to the Garrison occupation, although this has not been established (a second large domed cistern/well is located on the eastern side of Pikes Lane also within the study area; it has not been established who or what this cistern relates to) (see Figure 4.26). Subdivision plans from the early twentieth century also show a forge/blacksmith and a post office on the site. The forge or blacksmith shop may have also been on site since Dean's occupation, as William Dean operated a blacksmith in addition to the inn and tollbar.[12] As a stopping

point on the Western Road, a blacksmith would likely have been a profitable venture alongside a roadside inn, catering to travellers, wagons and coaches heading east and west along the road.

By 1829 a small village had grown around Dean's roadside inn. Originally known as Hebersham, and later renamed Eastern Creek, the village had a school house (to the west of the study area) and small church by the 1830s.[13] By the 1850s, with the discovery of gold around Bathurst, the Western Road was a busy thoroughfare, as prospectors headed west. Dean's inn by this stage had been joined by two others: one run by his son Thomas Dean (being the Red Lion approximately 200m from the Corporation Inn) and another further to the west outside the study area.[14] A number of houses and a few stores were also constructed at the small but busy road stop.

However, the main land use remained agricultural. Immediately to the west of the study area the Minchinbury vineyard had been established, while within the Parklands Precinct boundary were a number of orchards, as well as cattle farms and small dairies.

A 1917 sale plan of the land owned by Ernest Finckh, which covered the land on the western bank of Eastern Creek between the Western Road, Rooty Hill Road and Church Street, shows that there were only a scattering of houses, one store and a post office within the study area (Parklands Precinct). The post office appears on subdivision plans to be on the same site as the Garrison/Hollinsworth site, and was operated by Thomas Pike (who had married William Dean's second youngest daughter Ann, and had in turn operated the Bush Inn from 1847), probably from a room within or adjacent to the Hollinsworth house (see Figure 2.7). A service station and garage was also located within the study area, on the Western Road to the west of Rudders Lane. The village at Eastern Creek had largely stagnated after the opening of the railway line through Rooty Hill and Blacktown (north of the study site) in the 1860s. The main line ran to the north of the Parklands Precinct, with stations at Blacktown and Rooty Hill, around which villages and towns developed.

In 1919 the Western Road was sealed and then widened in the 1950s. However, the area as a whole retained its rural and agricultural setting. Aerial photographs from 1943 and 1956 show the outlines of paddocks and orchards, scattered farm houses and outbuildings, and the ribbon of development fronting the Western Road between Eastern Creek and Pikes Lane (see Figures 2.8 and 2.9).

Much of the area was resumed by the military during the Second World War for use as an airfield and training base. As well as Bungarribee estate, the military resumed all the properties west of the Eastern Creek, with Curry Street and Belmore Road as the boundaries. Following the end of the war, the land occupied by the military was taken up by OTC for their new transmitting station. Prior to resumption, the Department of the Interior undertook a survey and valuation of each property. Within the Parklands Precinct and Doonside Parcel (excluding Bungarribee House and farm), there were nine weatherboard cottages with associated outbuildings and sheds, at least three horse stables, some bush timber sheds and a variety of small farm buildings and structures.[15] These were spread across 37 separate portions of land between Belmore Road, Curry Street, the current Eastern Road and Eastern Creek. One of these portions, that of Mr J R Adams (Lot 4 Sec E DP 8681), also included a trotting track.

Of the structures visible in a 1956 aerial photograph, all but three (being a house on the corner of the highway and Pikes Lane and one closer to eastern Creek) have been demolished and removed through further widening of the Great Western Highway and more recent works for the M7 Motorway (see Figure 2.9 and 2.10).

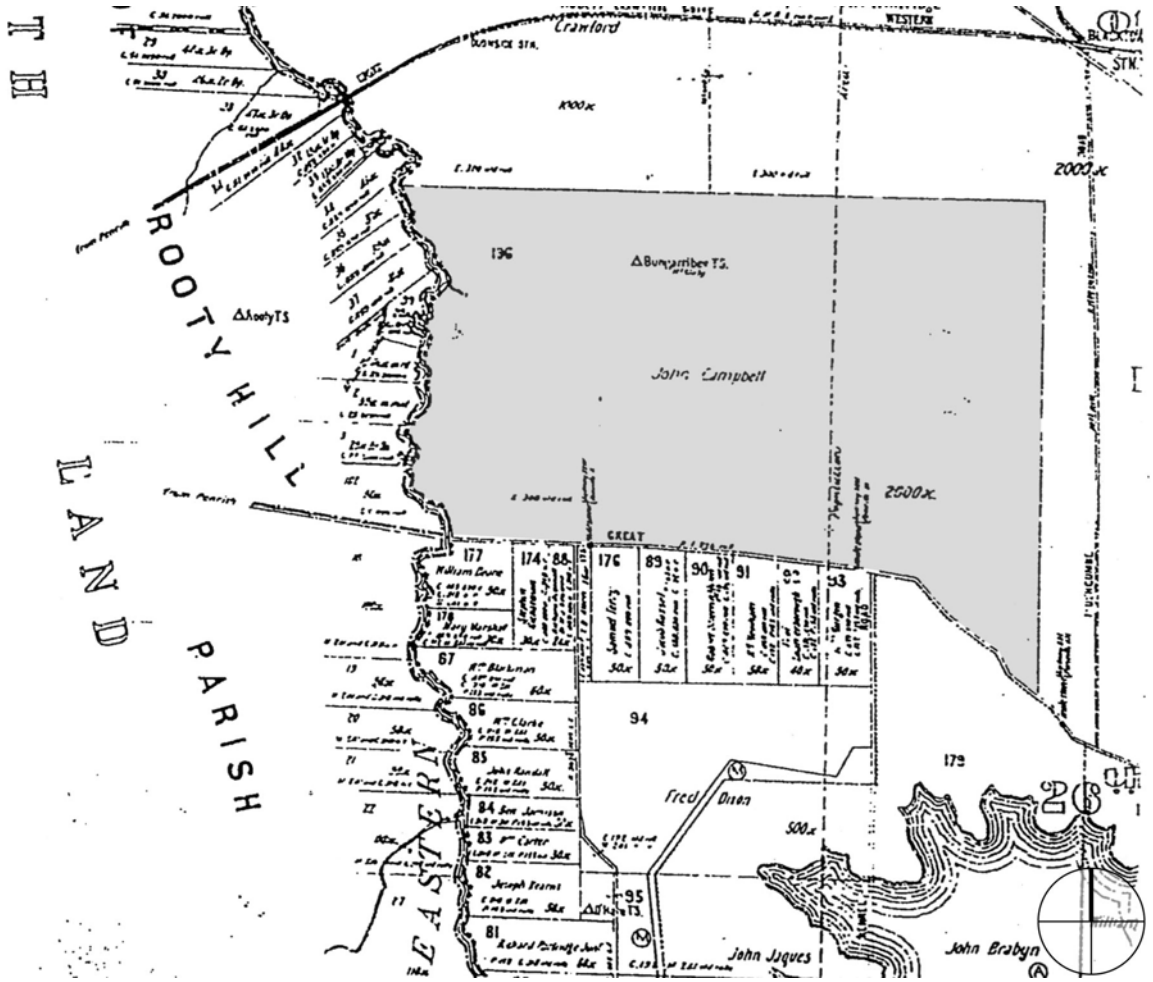


Figure 2.1 Survey plan showing John Campbell's 2000 acre grant upon which he built Bungarribee House, as well as the grants to William Dean and those bordering the Eastern Creek which make up the combined Doonside Parcel and Parklands Precinct. (Source: Department of Lands)

Figure 2.2 Joseph Fowles' painting of Bungarribee House during the occupation of the East India Company in the 1850s. This view, looking from the south near the junction of Eastern Creek and Bungarribee Creek, shows the house prominent on the ridge, with an extensive collection of outbuildings extending east towards present day Doonside Road. The house was clearly visible from the Western Road (Great Western Highway) and was a landmark to travellers along it. (Source: Mitchell Library)

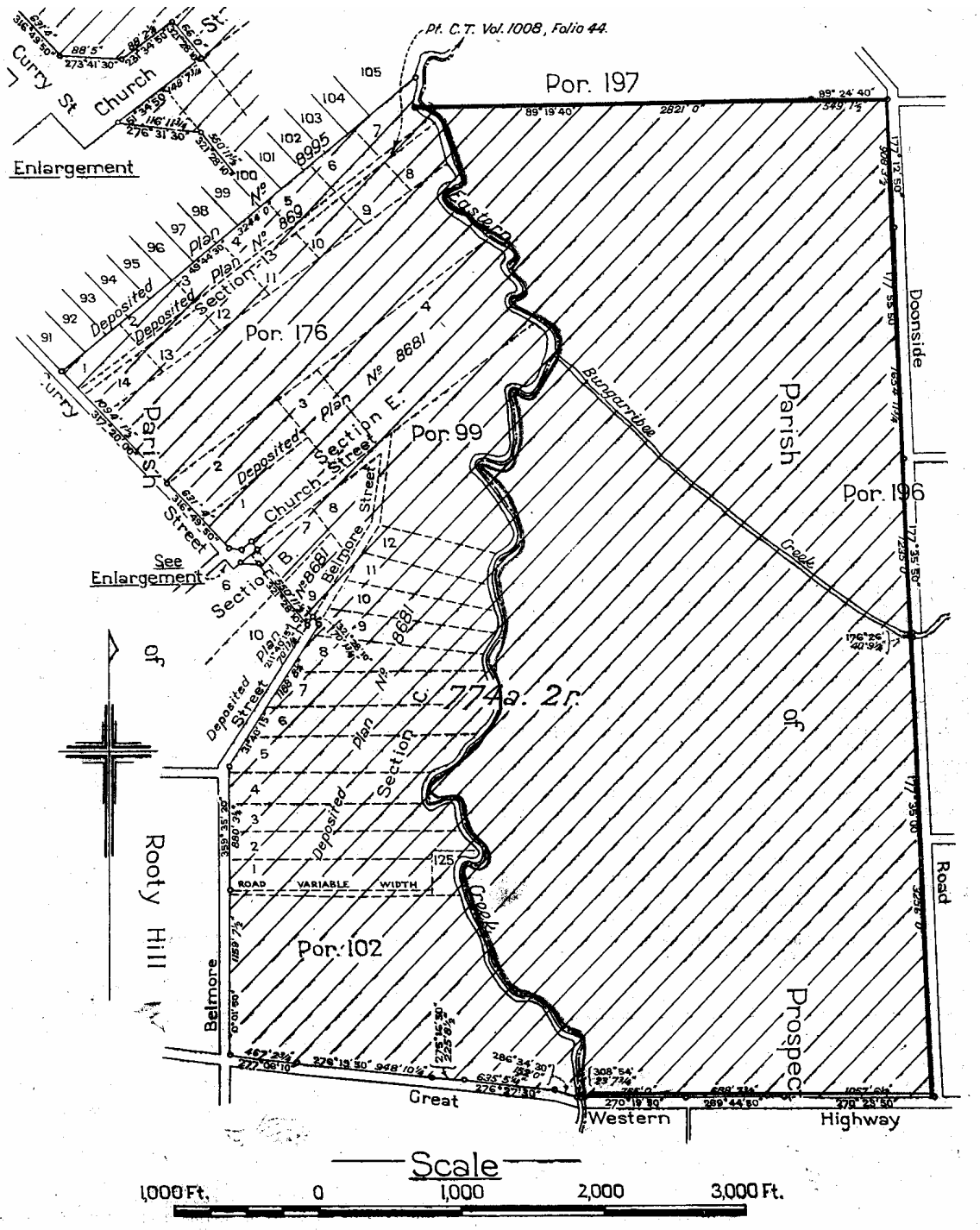


Figure 2.3 Survey showing the area resumed by the OTC for the construction of the Transmitting Station. The OTC resumed the same area as the military during World War II for the construction of an airfield and training area. The entire Parklands Precinct and Doonside Parcel north of the Western Road were taken over by the military during World War II, although the Bungarribee House site and its immediate surrounds were allowed to remain occupied and farmed. (Source: National Archives of Australia)

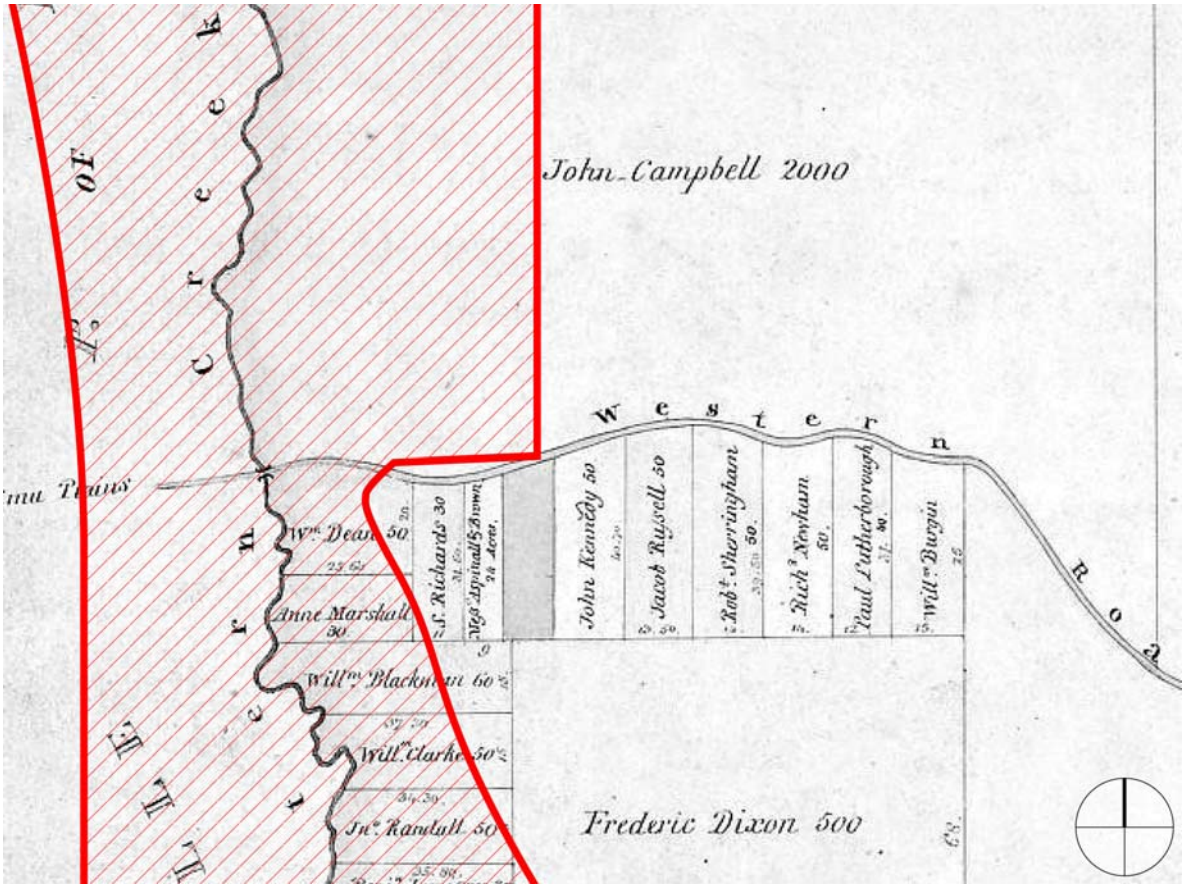


Figure 2.4 Detail of Parish of Prospect map 1838 showing the approximate boundary of the Doonside Parcel and Parklands Precinct in relation to the original grants in the Parish. The large 2000 acres of John Campbell was the site of the Bungarribee House and farm. Note William Dean's 50 acres to the south of the Western Road. (Source: Department of Lands)

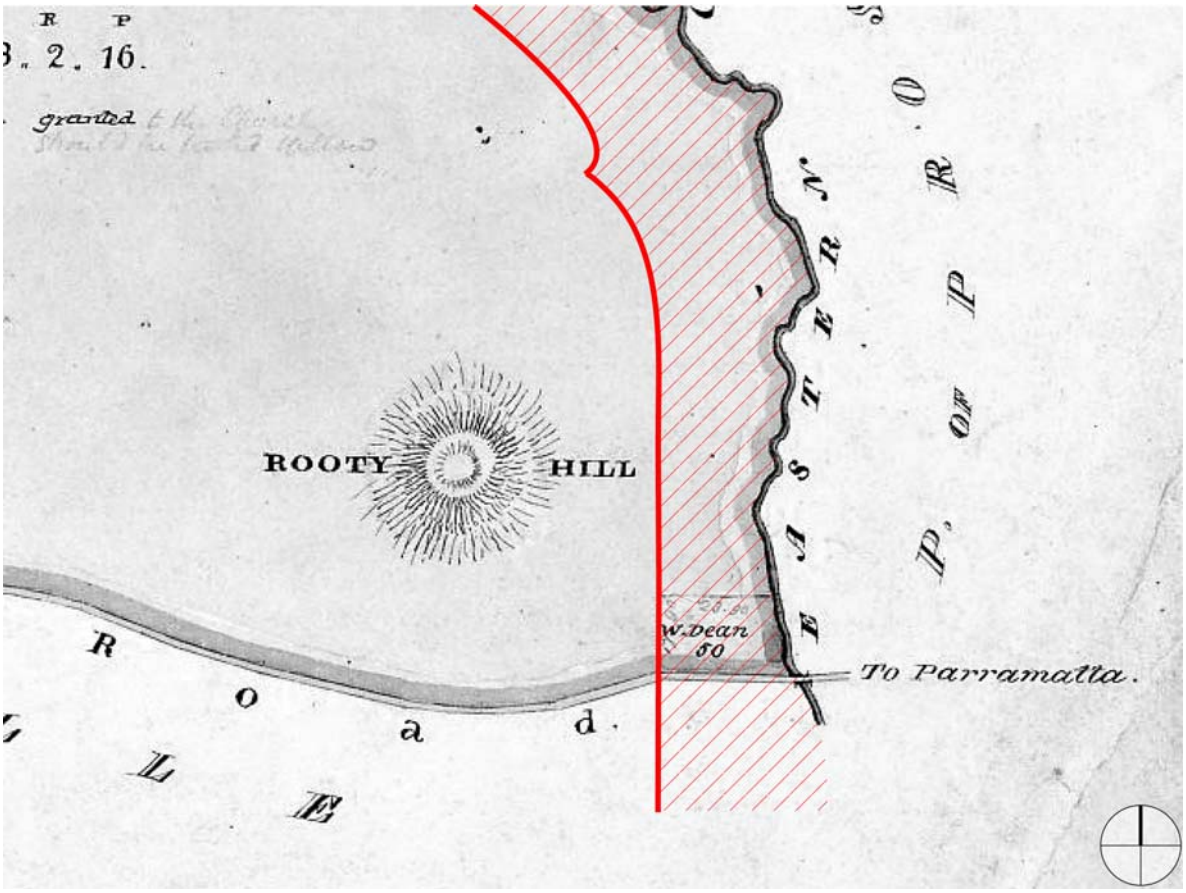


Figure 2.5 Detail of Parish of Rooty Hill map 1835 showing the approximate western boundary of the Parklands Precinct. William Dean's second grant of 50 acres is shown north of the Western Road. Most of the area at this time is still part of the government farm. (Source: Department of Lands)

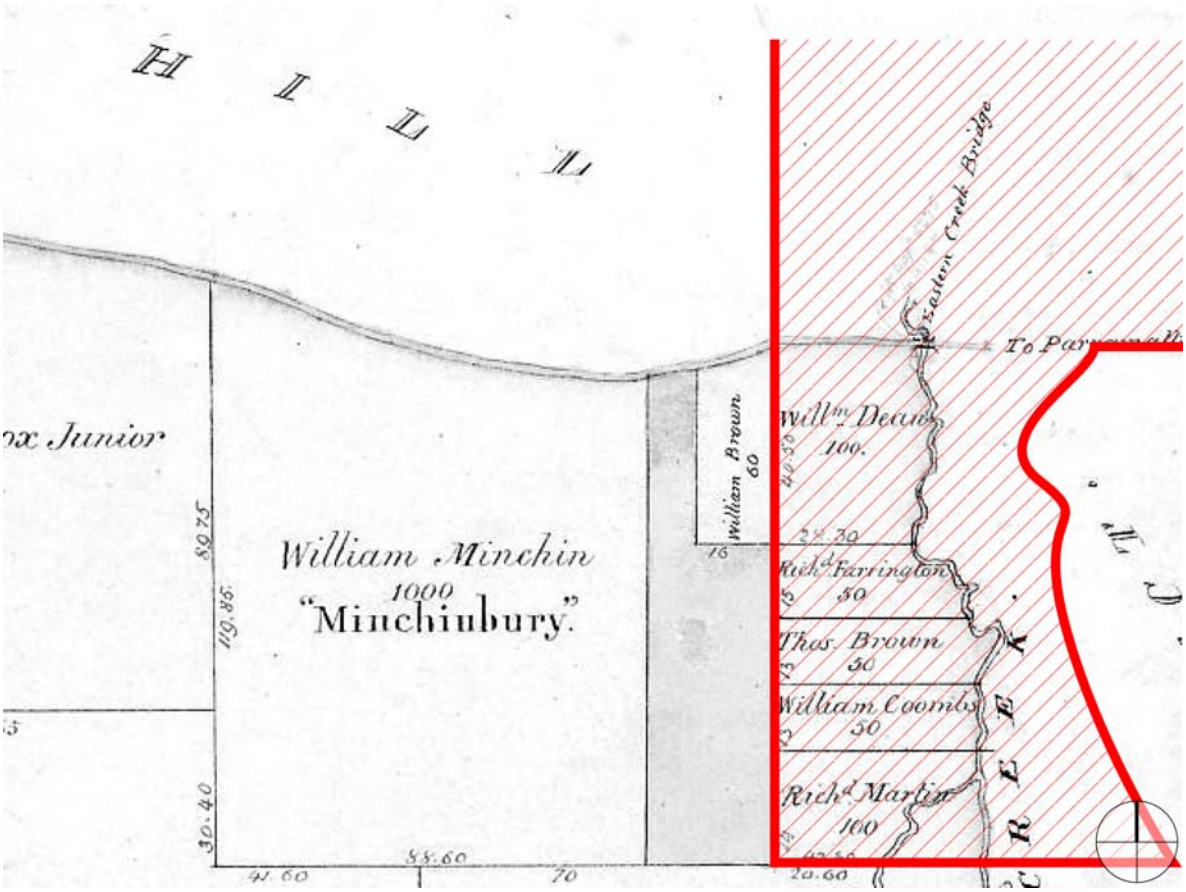


Figure 2.6 Detail of Parish of Melville 1835 showing the approximate area of the Parklands Precinct (hatched). This figure shows William Dean's 100 acre grant upon which he built his home and the Corporation Inn. Comparison with Figures 2.1 and 2.2 show the grants and owners in each of the three Parishes that constitute the site area. (Source: Department of Lands)

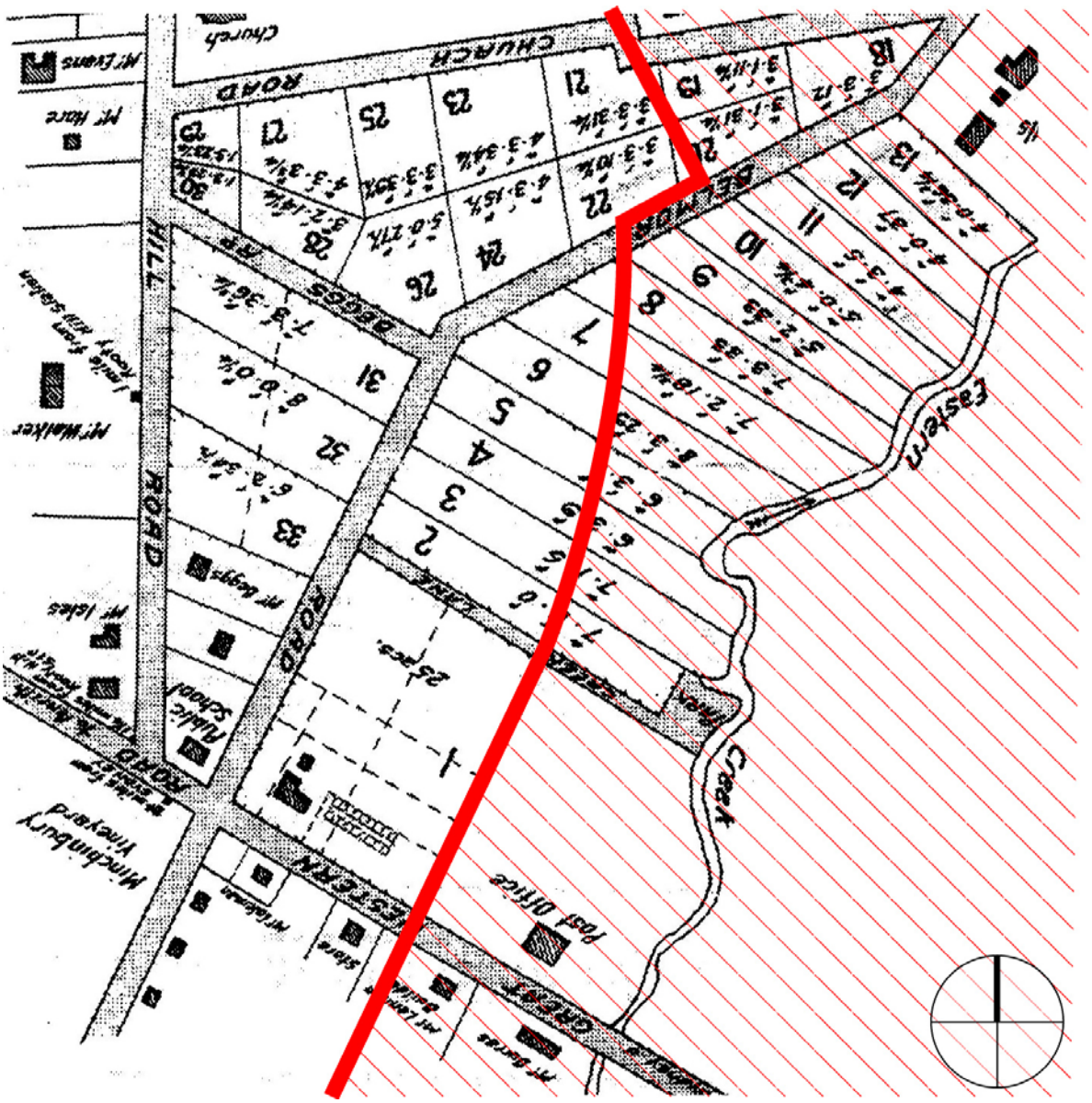


Figure 2.7 Detail of subdivision sale plan of Eastern Creek Farms, April 1917 by Ernest Finckh. This plan shows the scattering of development across the northwest corner of the Parklands Precinct at the time with a post office, store and a few houses shown. The buildings shown in the northeast corner of the plan are annotated as Mansell's Farm. The rural nature of the site area has remained largely unchanged for the duration of European occupation. The approximate location of the Parklands Precinct is shown hatched. (Source: Mitchell Library Subdivision Plans)

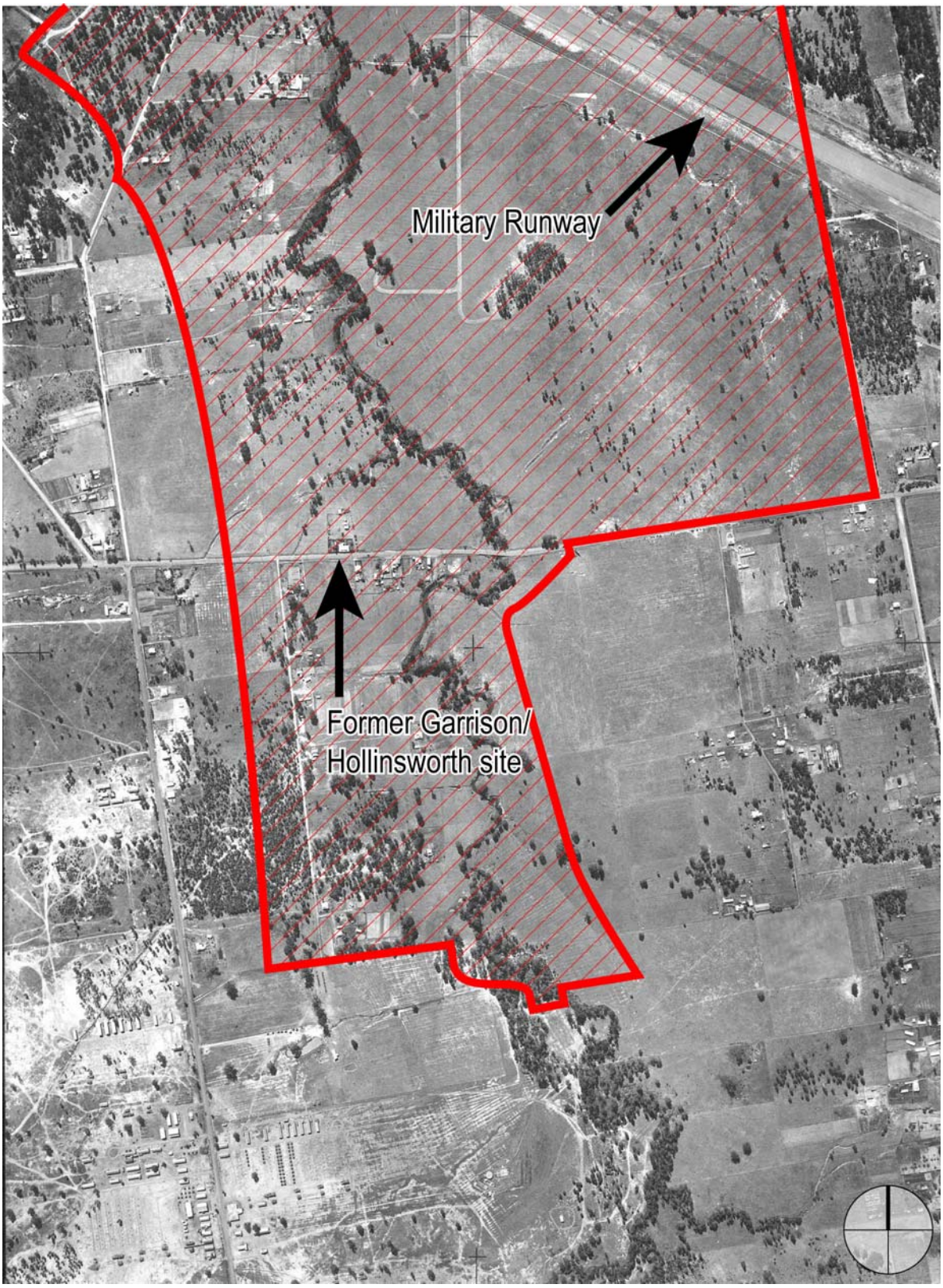


Figure 2.8 1943 aerial photograph showing the Parklands Precinct hatched. The Western Highway runs right to left through the centre of the image, with what Garrison/Hollinsworth thought to be the building and yard area shown on the northern side of the road to the west of the creek line. The military runway, with associated taxiway and aircraft hides, is also visible across the northeast corner. This photo shows the rural nature of the area, with some scattered development (particularly fronting the Western Highway) and areas under cultivation. This rural landscape has remained the dominant form since the first years of European occupation. (Source: RTA)

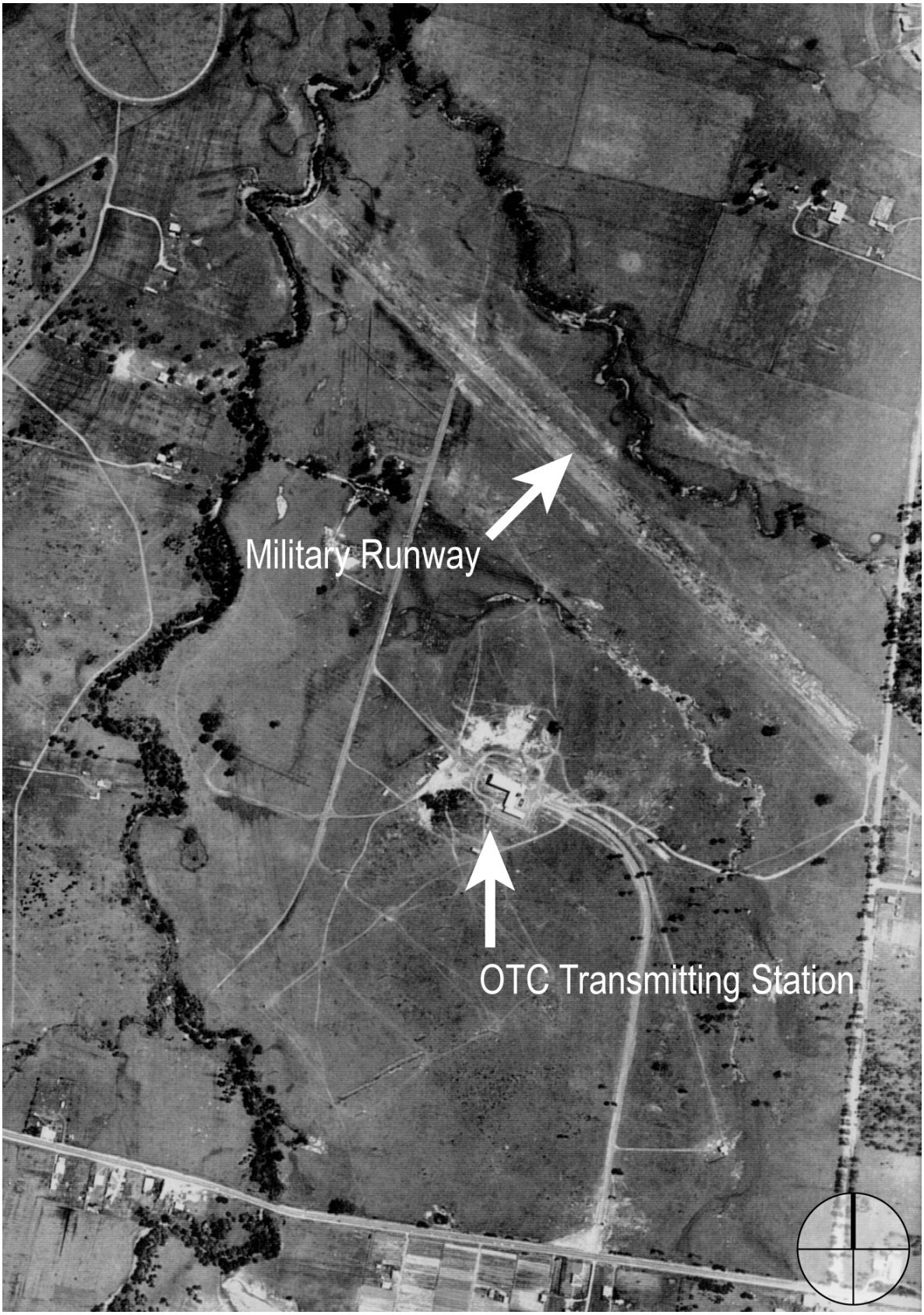


Figure 2.9 1956 aerial photograph showing the Western Highway with some structures facing it to the west of Eastern Creek. The OTC Transmitting Station, recently opened, dominates the central portion of the image, with tracks leading off to aerial pads. To the north the scar of the military runway is still visible in the ground, with Bungarribee House and its remaining outbuildings also visible. The trotting track of Mr JR Adams is also visible in the top left corner. (Source: Department of Lands)

Figure 2.10 2006 aerial photograph of the Great Western Highway near the junction with the new M7 motorway, which marks the western edge of the study area. The arrow indicates the former Western Road alignment. Directly opposite was the site of the Garrison/Hollinsworth house, and is the site of the existing brick cistern/well which may date to the garrison period. Comparison to Figures 2.7 and 2.8 show the effect of the widening of the highway and the demolition of most buildings on the southern side of the road. (Source: Department of Lands)

2.4 Endnotes

1 Nicolaidis, G 2000, *Eastern Creek and Land Settlers*, Blacktown City Council, p 7.
2 ibid, p 12.
3 Bungarribee Homestead Complex State Heritage Register Listing Heritage Office of NSW.
4 Broadbent, J 1997, *The Australian Colonial House: Architecture and Society in New South Wales 1788–1842*, Hordern House, Sydney, p 144.
5 Lattan, D 1986, Lost Glories: A Memorial to Forgotten Australian Buildings, Angus and Robertson, Sydney, p 62.
6 'Transit: Staff Magazine of the Overseas Telecommunication Commission', Volume 10, No. 2 March–April 1957.
7 Telstra Archives: OTC Records—Doonside Transmitting Station.
8 Sharpe, A 2000, *Blacktown District: Pictorial History*, Kingsclear Books, Sydney, p 33.
9 Austral Archaeology, Heritage Master Plan Telstra OTC Site, Great Western Highway Doonside, Main Report Vol prepared for Planning NSW October 2005, p 69.
10 ibid, p 69.
11 ibid, p 72.
12 ibid, p 72.
13 Conybeare Morrison International, 2006, Western Sydney Parklands—Non-Indigenous Conservation Management Plan (Draft), p 17.
14 Nicolaidis, op cit, p 89.
15 National Archives of Australia, Series SP 246/2, Proposed Acquisition of Land 1949.

3.0 The Former Kitchen Gardens

3.1 Further Research and Site Inspection

After the submission of the Concept Application for the proposed development, an 1832 survey plan apparently recording the location of the former kitchen gardens of Bungarribee Homestead was brought to the Applicant's notice by the Heritage Branch, Department of Planning (see Figure 3.1). The 1832 survey records a formal garden with what appears to be intersecting paths between garden beds, and three unidentified circular features on the central path.

Based on the surveyor's hand annotations, GML (with the Archaeological Computing Laboratory, University of Sydney) calculated the likely location of the gardens. The 1832 survey was made using one corner of the house as its datum. As the house has since been demolished, the location of the 1832 datum had to be estimated based on the visible archaeology and historic plantings on the homestead site. Figure 3.2 illustrates the approximate location of the gardens based on the 1832 survey annotations. Figure 3.3 shows its location relative to the proposed subdivision.

An aerial photograph taken in 2008 records the approximate area of the garden and records intersecting lines in the ground suggestive of the garden layout (Figure 3.4). However, this photograph may only record impressions in the ground caused by vehicles. Aerial photographs from 2006 provide less convincing evidence of the garden layout (Figure 3.5). Certainly, visual survey undertaken in the preparation of this report did not reveal such clear ground impressions in the area of the gardens (Figures 3.6 and 3.7).

GML undertook a visual survey of the area of the gardens in April 2008 in an effort to confirm the hypothesized garden location. The survey was undertaken after a night of rain. The likely garden area is low-lying, and the loamy soil was very muddy. Puddles had formed in the south of the area identified as the garden. The area was relatively level (but for a low mound c3x3m in area in the northeast). Although the area identified as the likely site of the garden had been slashed to improve visibility, nothing could be seen on the ground that would indicate that the area had been a garden.

In aerial photographs (Figure 3.3) some topographic features suggest the location of a causeway at the crossing of the creek between the house and gardens. No archaeological evidence of such a causeway could be found by visual inspection but the grass was very long and the ground boggy in this area (the possible location of the causeway lies outside the area of the garden and had not been slashed prior to inspection). Similarly, no evidence of a path recorded in the 1832 survey, or of a change in topography (possibly visible in aerial photographs) on the supposed north edge of the garden area, could be seen (Figure 3.3).

3.2 Geophysical Survey

In an effort to confirm the hypothesized location of the former kitchen gardens, APP (for Landcom) commissioned a geophysical survey of the area. The survey was undertaken in April 2008 by Alpha Geosciences Pty Ltd. The results are presented in the report in Appendix A. The report concludes that the data generated by geophysical survey confirms to a high degree of probability the location of the former kitchen gardens as extrapolated from the 1832 surveyor's notes.

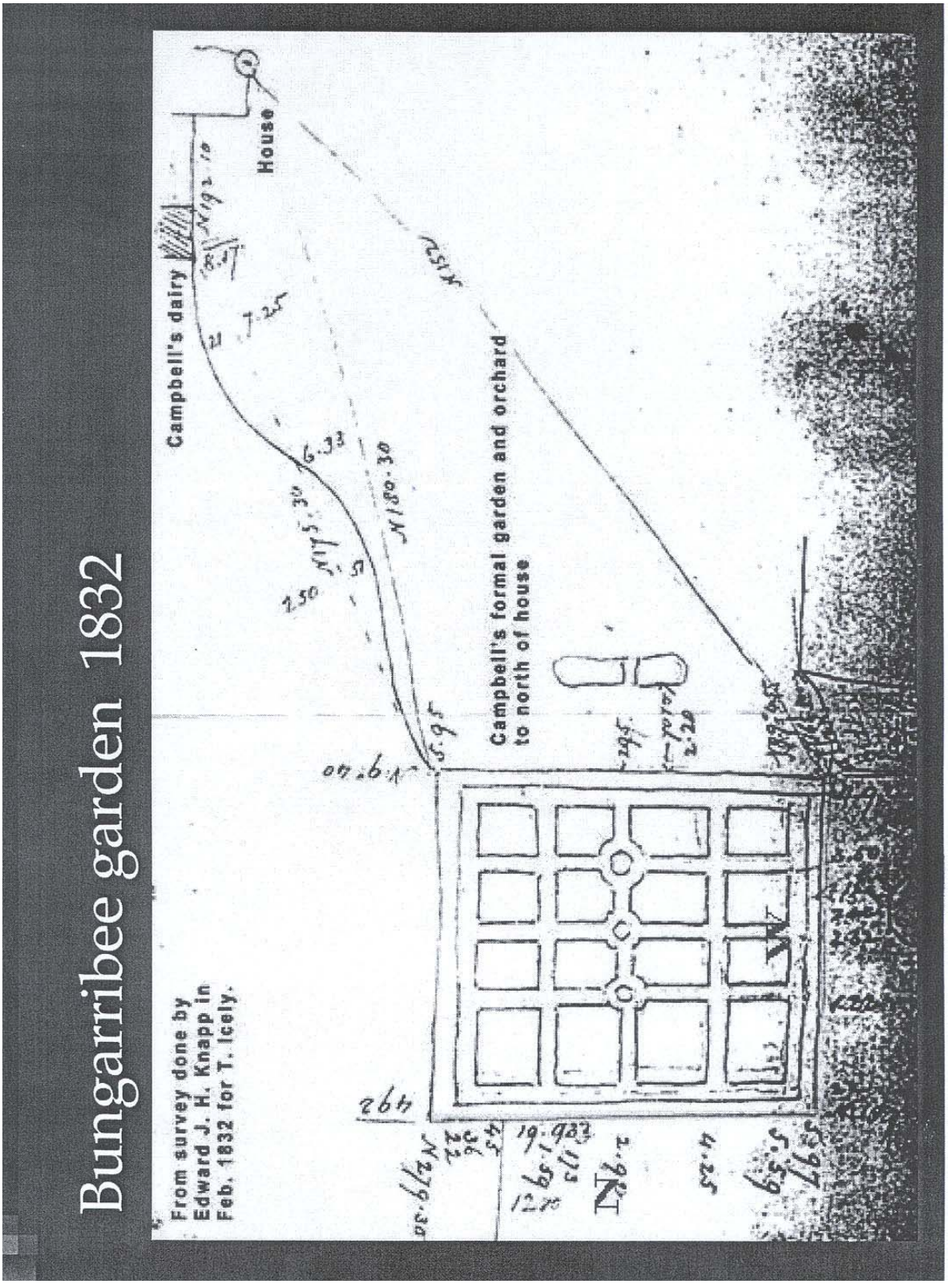
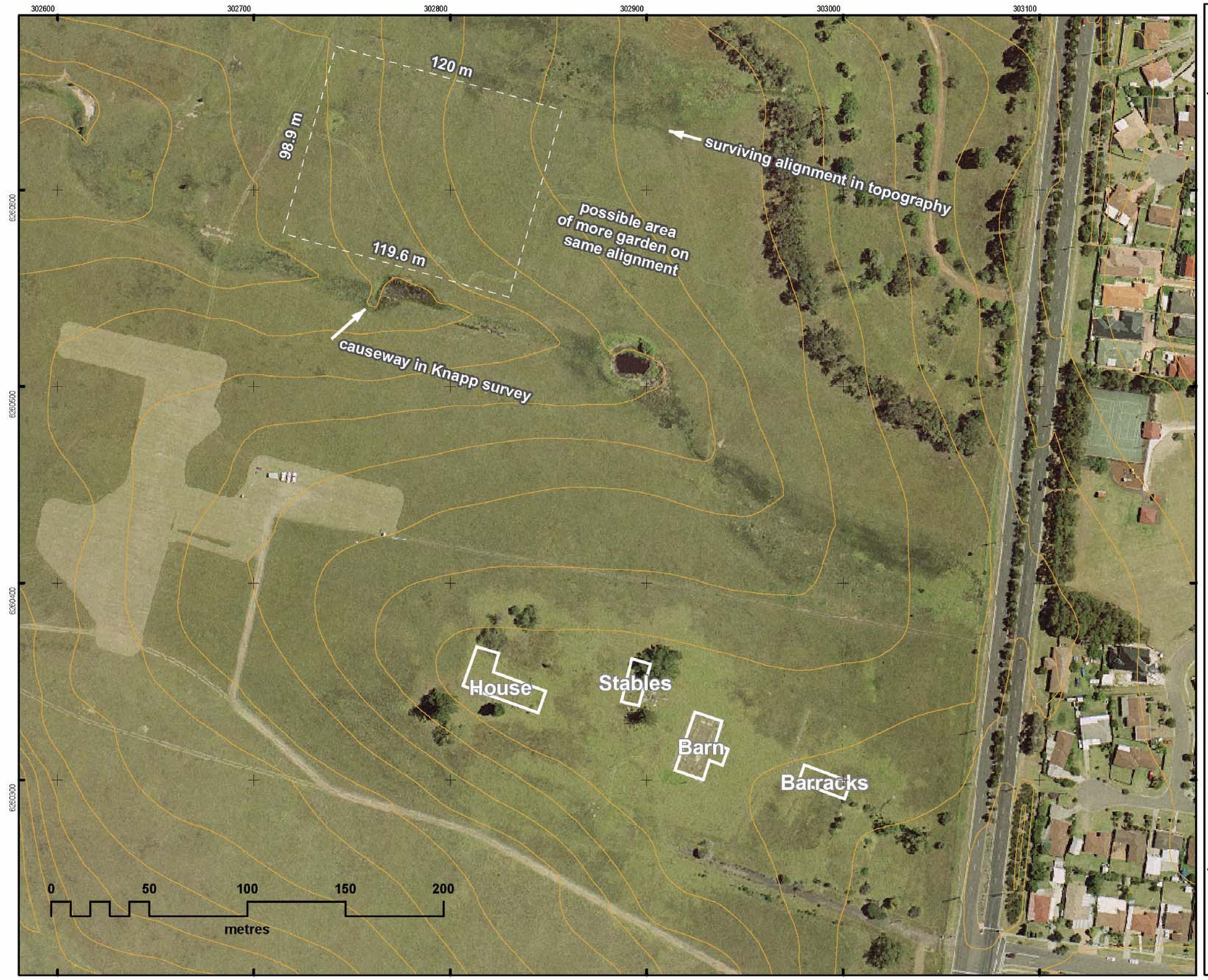


Figure 3.1 1832 survey plan with hand-made annotations upon which the likely location of the gardens has been calculated.



Bungarribee Garden 1832

Redrawn from survey by Edward Knapp Snr dated February 1832

Area of garden:
1.183361 Hectares
2.924148 Acres

Background:
2006 aerial photograph
© Ausimage SKM

Scale: 1:2,500

Datum: GDA 94
Projection: MGA
Zone: 56

Andrew Wilson March 2008

Archaeological Computing Laboratory
The University of Sydney
http://acl.arts.usyd.edu.au

Figure 3.2 Hypothesised location of the former kitchen gardens based on the 1832 survey annotations. Doonside Road is visible at the right of picture, with Douglas Road at right angles to it (bottom right of picture).

Bungarribee Garden 1832

Redrawn from survey by Edward Knapp Snr dated February 1832

Area of garden:
1.183361 Hectares
2.924148 Acres

Background:
2006 aerial photograph
© Ausimage SKM

Scale: 1:2,500

This map incorporates data which is © NSW Department of Lands 2001. The data has been used with permission.

Datum: GDA 94
Projection: MGA
Zone: 56

Andrew Wilson March 2008

ACL Archaeological Computing Laboratory
The University of Sydney
http://acl.arts.usyd.edu.au

Figure 3.3 Hypothesised location of the former kitchen gardens based on the 1832 survey annotations, overlaid on the proposed plan of subdivision. Doonside Road is visible at the right of picture, with Douglas Road at right angles to it (bottom right of picture).

Figure 3.4 2008 aerial photograph with the hypothesised location of the former kitchen gardens overlaid (source: Google Earth)

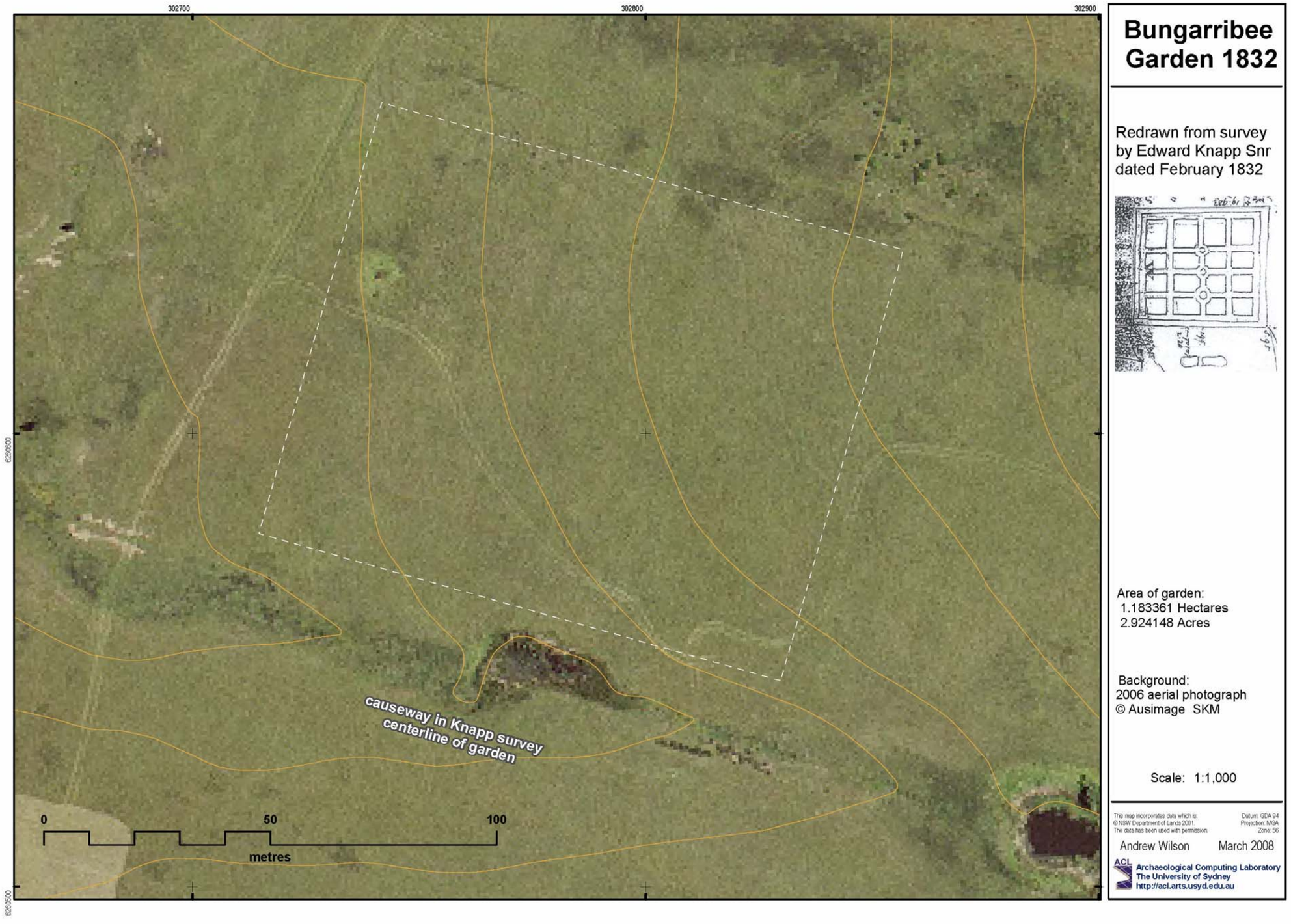


Figure 3.5 2006 aerial photograph with the hypothesised location of the former kitchen gardens overlaid (source: Google Earth)

Figure 3.6 View of the likely area of the former kitchen gardens, looking south to the site of the homestead (note the trees).

Figure 3.7 View of the likely area of the former kitchen gardens, looking east to Doonside Road (lined by trees in the distance).

4.0 The Potential Archaeological Resource

4.1 Statutory Listings—Archaeology

The State Heritage Register citation for the Bungarribee Homestead Complex concentrates on the potential archaeological remains of the *house, barn and convict barracks. However, it includes a reference to a notice in the Sydney* Gazette (1828) that records on the site:

> *a garden consisting of 8 acres, with a great number and variety of young fruit trees well watered …*

4.2 Site Formation Processes

The site of the former kitchen gardens has been subjected to the following activities/episodes with the potential to disturb or destroy its archaeological relics:

- Grazing activities—the movement of cattle across an area prone to flooding has the potential to disturb relics within muddy soils.
- Wetting and drying—Botanical remains are preserved as macrofossils (seeds, fruits, charcoals etc) and microfossils (pollen, phytoliths). With respect to macrofossils, these can be preserved in anaerobic sediments (usually permanently waterlogged/dry) and if charred (partially burnt) or mineralised (fossilised). There is low potential for such fossils to have survived within the garden site although bushfires may have enhanced that potential. With respect to microfossils, wet ground (as was the case when the site was visited in April 2008) may indicate that conditions will allow the preservation of pollen and macrofossils, but even temporary drying can result in the total loss of pollen and macrofossils. As pollen requires anaerobic, usually permanently waterlogged/dry, conditions to persist and given that the site has been subject to repeated wetting and drying there is a low potential for pollens to survive. Phytoliths are persistent in all conditions and may therefore survive at the site of the gardens.

4.3 The Potential Archaeological Resource

Notwithstanding the above post-depositional site formation processes, the results of the geophysical survey presented in Appendix A suggest that there is potential for relics (paths, garden beds etc) to survive in the area. However, the grid-like appearance of the plans contained in the geophysical report are to a large degree a result of the transect methodology utilised in the survey, and give an exaggerated impression of regularity.

The kinds of relics that might survive at the site include:

- Palaeo-botanical remains—see Section 4.2 above. There is low potential for macrofossils and microfossils to survive at the site of the gardens, and a higher potential for phytoliths to survive there. Where they survive, the most likely relics are:
  - phytoliths (silica microfossils);
  - evidence of tree fruits and berry fruits such as peaches, apples, raspberries (all of which have notably hardy seeds); and
  - pollen.

- Paths, garden beds and the unidentified circular features recorded in the 1832 survey—It is unclear how the paths and garden beds of the kitchen gardens were formed. The geophysical survey detected small changes in the magnetic field in the area that might indicate variations in soil type, the existence of drainage channels, kerbing etc. A visual inspection of the area carried out by GML in April 2008 did not identify any clear evidence of the former kitchen gardens but the soils were muddy after a night of rain and the grass, although short, relatively thick. There is some potential for archaeological evidence of the paths, garden beds etc to survive at the site although the evidence is likely to be ephemeral (eg a thin layer of gravel used to partially seal paths) and possibly difficult to detect by sight unless conditions are ideal. Excavation to the underlying clays may expose hoe marks (a kind of 'relic' that has been exposed in similar sites at Parramatta, for example).

5.0 Assessment of Significance

5.1 Guiding Principles

5.1.1 Assessment Criteria

Assessments of cultural significance identify the heritage values that a place may embody. The former NSW Heritage Office (now the Heritage Branch, Department of Planning) has published a number of criteria to assist practitioners in assessing the heritage significance of a place.

They are:

Criterion (a) An item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area).

Criterion (b) An item has strong or special association with the life or works of a person, or group of persons, of importance in the cultural or natural history of NSW (or the cultural or natural history of the local area).

Criterion (c) An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).

Criterion (d) An item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.

Criterion (e) An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area).

Criterion (f) An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area).

Criterion (g) An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places; or cultural or natural environments (or a class of the local areas cultural or natural places or cultural or natural environments.)

5.1.2 Assessment Methodology

Assessing the heritage values of archaeological relics is made more difficult by the fact that the extent and nature of the archaeological features is often unknown. It becomes necessary for judgments to be formulated on the basis of expected or potential attributes. The element of judgment can be enhanced by research, as has been carried out in the case of the current study.

Where archaeological relics are found to embody significant heritage values, it is usually because they have satisfied Criterion C above. Although relics may also satisfy other criteria.

5.1.3 Additional Criteria

While the above assessment criteria provide an overall framework for significance assessment, they are not specific with regard to archaeological sites, and historical archaeological sites in particular. This is a matter that has been considered in an influential paper by Bickford and Sullivan, published in 1984.[1] Bickford and Sullivan draw attention to the dilemma faced by archaeologists and developers, in connection with sites that are to be destroyed as a result of development, and discuss effective means of assessing their heritage value. Archaeological significance has long been accepted in the United States as linked directly to scientific research value:

A site or resource is said to be scientifically significant when its further study may be expected to help answer questions. That is scientific significance is defined as research potential.[2]

This is a concept that has been extended by Bickford and Sullivan in the Australian situation and redefined as the following three questions which can be used as a guide for assessing the significance of an archaeological site within a relative framework:

1. Can the site contribute knowledge that no other resource can?

2. Can the site contribute knowledge that no other site can?

3. Is this knowledge relevant to general questions about human history or other substantive questions relating to Australian history, or does it contribute to other major research questions?

The evaluation of heritage significance below is based on the criteria provided by the Victorian Heritage Council, augmented by the questions posed by Bickford and Sullivan.

5.2 Previous Significance Assessments

The State Heritage Register citation for Bungarribee Homestead does not specifically address the potential archaeology in the location of the former kitchen gardens, concentrating more on the potential archaeological resource of the house, barn and convict accommodation. However, the citation explicitly identifies the complex as an archaeological site, and it is listed on that basis. In terms of the site's research potential (criterion (e) above), which applies equally to all potential archaeology at the site, the citation states:

The Complex has the potential to yield significant information about the evolving agricultural and pastoral activities of an early homestead in the western region of Sydney. It has the potential to yield information relating to the initial construction and occupation of the homestead, as well as the barracks, barn and other outbuildings, as very little is currently understood about its construction phases. Bungarribee Homestead's long and continual occupation from its construction in 1823 to its demolition in 1957, would provide significant information relating to the changing economic status of early homesteads in rural settings. The site also has the potential to provide significant information relating to the domestic conditions and social status of early settlers, and the working life and conditions of domestic employees as well as farm assistants.

5.3 Significance Assessment—The Potential Archaeological Resource as a Research Tool

5.3.1 Value to Areas of Research

A range of 'Australian Historic Themes' were developed by the former Australian Heritage Commission as a framework within which heritage professionals may identify, investigate, assess and manage heritage values. The NSW Heritage Council has developed a range of State-specific themes ('the NSW Historical Themes') to augment the Australian Historic Themes.

The State Heritage Register citation for the Bungarribee Homestead Complex lists the historic themes that the site reflects. Those most relevant to the area of the former kitchen gardens relate to research into the development of local and regional economies and activities relating to agriculture (the cultivation of plant species).

The area of the former kitchen gardens has the potential to:

- confirm the location of the former kitchen gardens relative to the house complex;
- demonstrate early cultivation techniques (drainage, garden layout, introduction of soils etc);
- establish the species of plants cultivated in the gardens; and
- illustrate the influence of English landscaping fashions on colonial New South Wales.

5.3.2 Additional Criteria

The potential archaeological resource at the site may be a valuable source of information that could sometimes supplement data available from other sources and sometimes contribute historical information that other sources would not be able to provide. In answer to the Bickford and Sullivan questions presented above:

Can the Site Contribute Knowledge that no Other Site Can?

The archaeological relics of the former kitchen gardens would be almost unique to the region and rare in the State. The information that they might contribute to research into Bungarribee Homestead could not be obtained from other sites. The information they could contribute to studies of colonial western Sydney and the State could be obtained from only a small number of similar sites.

Can the Site Contribute Knowledge that no Other Resource Can?

The archaeological relics of the former kitchen gardens may augment knowledge about colonial agricultural practices obtainable from other sources of information including seed catalogues, the records of the Royal Botanical Gardens, journals etc. No other resource could contribute data particular to Bungarribee Homestead that the garden archaeology could.

Is this Knowledge Relevant to General Questions About Human History or Other Substantive Questions Relating to Australian History, or Does it Contribute to Other Major Research Questions?

The information that the archaeology in the former kitchen gardens could contribute would be relevant to the study of early agricultural practices, diet and labour in NSW. For more specific research questions the site might address see Section 6.0 below.

5.4 Conclusion

The potential archaeological resource within the former kitchen gardens of Bungarribee Homestead has high significance for its research potential.

5.5 Endnotes

1 Bickford, A and S Sullivan 1984, 'Assessing the Research Significance of Historic Sites', in Sullivan S and S Bowdler (eds) *Site Surveys and Significance Assessment in Australian Archaeology* (Proceedings of the 1981 Springwood Conference on Australian Prehistory), Department of Prehistory, Research School of Pacific Studies, The Australian National University, Canberra.

2 Bickford and Sullivan, op cit, pp 23–24.

6.0 Archaeological Research Design

6.1 Basic Research Framework

The following questions provide the general research context for any future site investigation:

- What is the extent of the surviving archaeological evidence?
- What is the nature of extant archaeological features?
- What physical evidence of former activities survives on the site?
- What is the date of the identified elements?
- What can the material culture contribute to our knowledge about this site or other sites?

More specifically, the aims of the proposed test excavation are to:

- Capture palaeo-botanical data through a program of soil sampling across the site.
- Locate individual test excavation trenches in locations with the highest potential for garden relics such as paths etc, especially the central avenue in the area of the unidentified circular features.
- Characterise the site's taphonomy ie the processes that have impacted on the archaeological record.
- Gather data against which the results of the geophysical survey can be measured.

6.2 Additional Research Questions

The site might yield data that could be used to address questions concerning:

- The range of plants cultivated at the gardens. This data could be used to shed light on the diet of the early settlers at Bungarribee Homestead and in the region.
- Agricultural techniques, including the transfer of English technologies, and their modification to suit Australian conditions.
- The nature and extent of the gardens, including the nature of the unidentified circular features recorded in the 1832 survey.
- The value of geophysical survey in similar conditions elsewhere.
- The kinds of site formation processes that operate at such sites, and the value of archaeologically investigating similar sites in the future.

6.3 Proposed Test Trenches

6.3.1 Location

Figure 6.1 illustrates the location of the proposed test trenches.

6.3.2 Excavation Methodology

Excavation should be carried out by experienced archaeologists. An excavation director should be appointed who has previously had excavation permits issued in their name by the NSW Heritage Council (or delegate).

Given the vulnerability to disturbance of the potential archaeological resource in the garden area, the proposed test trenches should be excavated by hand (pick, shovel and trowel), although it may be necessary to remove the first layer of grass using a small bobcat. The excavation director should monitor any machine work carefully and should make recommendations for tracks used, access and egress points etc, as appropriate.

The archaeologists should have authority to direct site works, as required, in order to undertake all necessary investigation or detailed recording.

Spoil should be stock piled on site for the duration of the test excavation, and back filled upon completion of the works.

The depth of excavation required across the site should be determined by the excavation director, based on the nature of the subsurface profile.

The need for detailed investigation and recording of specific deposits or features should be determined by the excavation director throughout the course of the investigation to ensure that the important parts of the site are adequately investigated and recorded, and that resources are not employed in areas that do not warrant further investigation. The investigation should continue until:

- the excavation director is satisfied that the research potential of the subsurface deposits has been realised and that the site has been adequately investigated and recorded; or
- culturally sterile deposits have been encountered across the site.

6.3.3 Soil Sampling Strategy and Analysis

The soil sampling strategy should include two sample types:

- Microfossil samples, primarily for pollen. These samples should comprise small bags of soil (c100g maximum weight) from the likely garden bed areas. It is vital that the samples be taken in a manner that minimises contamination by the topsoil. Thus, only samples from intact soil profiles should be taken. At least ten soil samples should also be collected from the topsoil to act as a basis for comparison to the pollen samples.
- Macrofossil samples should be collected from each of the likely garden beds, again from the strata beneath the topsoil. The archaeologists should also collect at least five samples from the topsoil for comparison purposes. All samples should be a minimum of 50 litres in volume. They should be wet-sieved on a 1mm mesh sieve to remove as much soil as possible. One litre from each sample should be retained unsieved.

A minimum of twelve samples should be collected for each type (microfossils and macrofossils). The sieved material should be bagged.

Samples should be taken from each likely garden bed in order to get best site coverage and spatial analysis data.

If the soil is sodden when collected, and the samples contain a lot of organics, they should not be dried after sieving. They should be sealed in bags and analysed in a laboratory as soon as possible.

6.3.4 Site Recording

The entire investigation process should be recorded photographically. Additional detailed site recording should be undertaken (measured drawings, context sheets etc) if and when archaeological deposits and features are encountered. Measured drawings should be made of physical remains. The location of exposed structural relics (such as kerbing, wall footings) should be recorded by survey.

6.3.5 Artefacts

Any artefacts that are recovered should be provenanced according to their contexts.

Artefacts should be conserved (washed and bagged) and stored in an appropriate repository, observing specialist conservation requirements where appropriate (eg for leather artefacts).

Artefacts should be logged in a database that reflects current best-practice archaeological data recording.

6.3.6 Reporting

A report of the results of the fieldwork should be produced at the completion of the archaeological investigation. This report should include:

- a description of the results of the investigation, including a discussion of the nature of the archaeological remains recorded;
- a response to the research questions raised in this Archaeological Research Design;
- a discussion of the relics recovered by excavation including artefact or sample analysis;
- site records, including measured drawings and photographs;
- a CD containing the artefact database; and
- conclusions relating to the nature and extent of surviving archaeological remains.

6.3.7 Publication

In view of the potential research value of the site and the context of the proposed investigations, as a mitigative measure any substantive or significant results should be published in both:

- a relevant refereed scholarly journal; and
- an accessible ‘popular’ magazine or journal.

Publication should be included as a core part of the proposed mitigative strategy.

6.3.8 Occupational Health and Safety Requirements

Occupational Health and Safety requirements should be adhered to at all stages of the project. Such constraints (eg soil contamination) may affect the areas of the site that may be investigated, or the degree to which these areas may be investigated or recorded. Such safety constraints should override any heritage requirements. Any consent to excavate test trenches should allow a

degree of flexibility to relocate trenches, at the discretion of the Excavation Director, where this would result in improved safety conditions.

6.3.9 Training of On Site Personnel

All relevant site personnel (including contractors) should attend a site induction prior to commencement of works on site to ensure that all are aware of the heritage issues associated with the site and the role of the Excavation Director and other archaeologists.

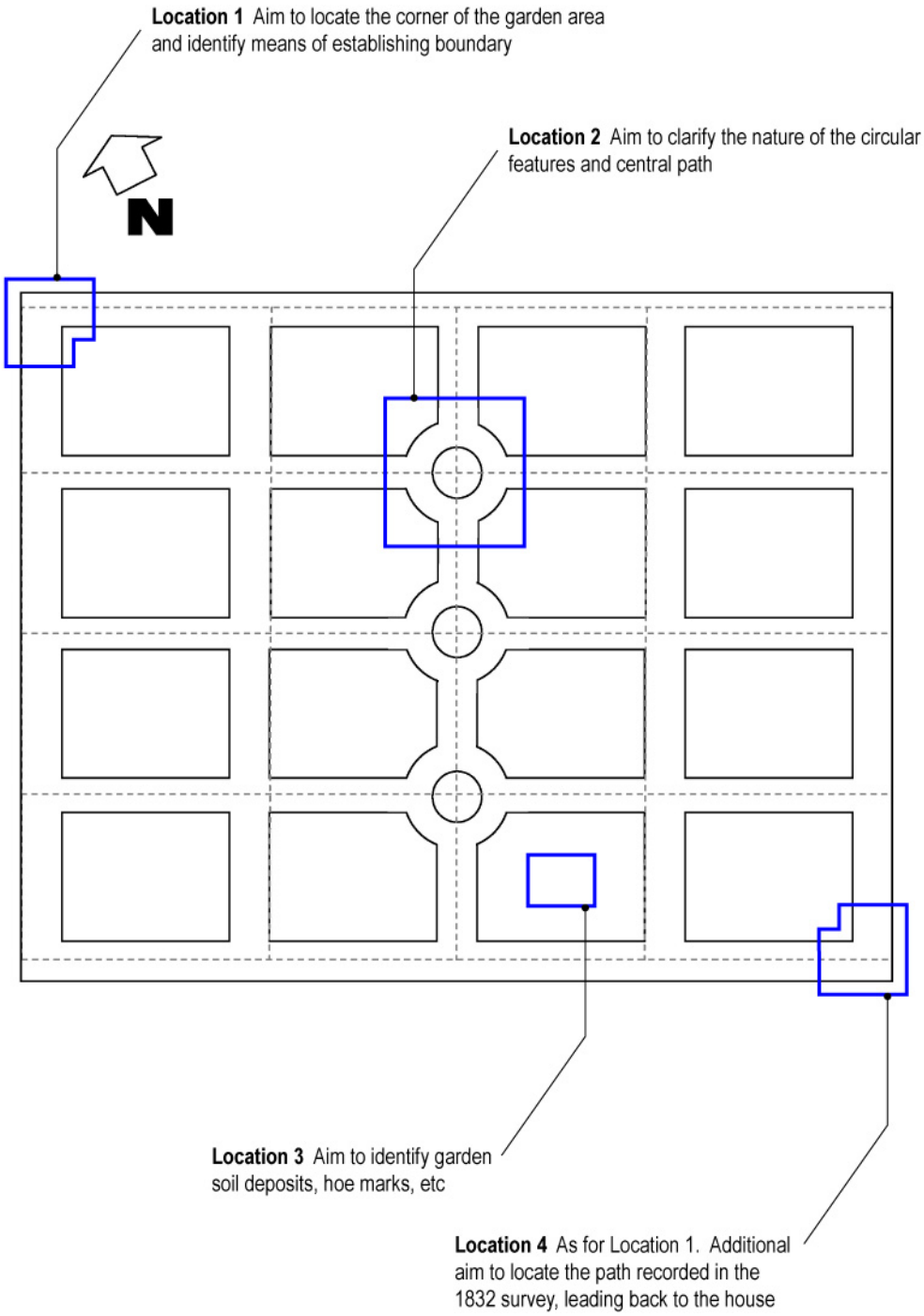


Figure 6.1 Plan showing the location of proposed test trenches.

7.0 Conclusions and Recommendations

7.1 Conclusions

The site has low-to-moderate potential to contain archaeological relics belonging to the former kitchen gardens of Bungarribee Homestead depending on the relics type.

Those relics might include:

- paths, kerbs, hoe marks, soil deposits and garden beds—moderate potential; and
- palaeo-botanical remains such as seeds and microscopic plant remains—low potential with a higher potential for pollen.

The potential archaeological resource is likely to have a high research value (criterion (c) of the heritage assessment criteria prepared by the former Heritage Office).

Provided that the research potential of the gardens is realised through appropriate archaeological investigation and reporting, the archaeological significance of the site can be appropriately managed without a requirement for in situ conservation.

If consent for the proposed development does not require that the area of the former gardens is retained as open space, this Archaeological Assessment and Research Design provides an appropriate strategy for the investigation and management of the potential archaeological resource.

7.2 Recommendations

Any archaeological investigations of the former kitchen gardens should be undertaken consistent with the methodology presented in this Archaeological Assessment and Research Design.

The results of any archaeological investigation of the kitchen gardens should be used inform future interpretation measures at the Bungarribee Homestead site.

Substantive, significant results from the archaeological excavation should be published in both academic and ‘popular’ media.

8.0 Appendices

Appendix A

Appendix A—Geophysical Report

Appendix A

Appendix A—Geophysical Report

Geophysical Services for the Environmental, Engineering and Ordnance Industries

Alpha GeoScience

PROJECT:	**GEOPHYSICAL SURVEY** **Total Field Magnetics**
AREA:	**Bungarribee Historical Site, Doonside NSW**
CLIENT:	**APP Corporation Pty. Limited**
PROJECT NO:	**AG-238**
CLIENT P/O:	**Email: Tuesday, 29 April 2008**

Alpha Geoscience Pty. Limited
(ABN 14 080 819 209)

Unit 1, 43 Stanley Street
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Australia

Phone: +61 (0) 2 9584 7555
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Email: info@alpha-geo.com

Peakhurst.

REPORT

Total Field Magnetics investigation to delineate location of 19th century gardens Bungarribee Historical Site, Doonside, NSW.

for

APP Corporation Pty. Limited
Suite 2, Level 4, 6 Newcomen Street,
Newcastle NSW 2300

Telephone: (02) 4928 7607
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By

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Authorised by:

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Jamie Speer BSc. Geophys Hon Geophys / Geochem

Senior Geophysicist

Date: 9 May 2008

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Alpha Geoscience Reference: AG-238

TABLE OF CONTENTS

1. INTRODUCTION

Alpha Geoscience Pty. Limited (Alpha), based in Sydney, NSW, was contracted by APP Corporation Pty. Limited to undertake a Total Field Magnetics (TFM) survey over a 1.15 ha area at Bungarribee Historical Site, Doonside.

The objective of the survey was to determine the location of a garden that was built near the old homestead in 1832.

2. AUTHORITY

Carlos Lopez provided the authority to proceed with this project by way of email 29th April 2008.

3. SURVEY RATIONALE

Total field magnetics involves measuring the strength of the magnetic field around the magnetometer sensor. Measurements taken by the magnetometer include the background field strength of the earth combined with any additional magnetic flux from other objects near the sensor. Therefore the total magnetic field strength varies depending on what objects are encountered. The gardens that previously stood on the survey area will have left behind variations in soil type, altered drainage channels and possibly some rocks and/or bricks that may have been used around the edges of garden patches which would each have their own magnetic contribution to the background magnetic field.

4. MAGNETOMETER SYSTEM

A Geometrics G-858 Caesium Vapour Magnetometer with a dual sensor gradiometer setup was used for the survey. The G-858 uses the caesium lamp and absorption chamber method to measure the strength of a magnetic field which is one of the most sensitive and accurate portable magnetometer configurations available. The G-858 has a sensitivity of 0.01 nT.

The dual sensor gradiometer setup allows faster acquisition as the density of data acquired per unit time is twice that of a single sensor setup. It also allows the data to be plotted as the difference of the two sensors (gradient) in addition to the outright magnetic field.

Grid information was acquired using a Trimble AG-132 DGPS. The DGPS was connected directly to the magnetometer so that the output data contained the magnetic field reading and lat/long coordinates. This setup gives higher accuracy and faster acquisition than using a manually laid out local grid.

The survey was walked along N-S trending lines with a 2m line spacing which resulted in a 1m profile spacing between the magnetometer sensors through the entire survey.

5. SURVEY AND DATA PROCESSING

5.1 *Survey Area*

The survey area was 1.15 ha (~ 95m x 121m), approximately 200m north of the old homestead.

The survey area was largely wet and muddy at the time of the survey.

5.2 *Survey Parameters*

The survey was conducted on 01/05/2008.

The survey was walked in a NNE-SSW direction with a 1m line spacing at the magnetometer sensors. The boundaries of the survey were defined by the extents of the cut grass.

Spatial data was acquired for each data point using DGPS and data was recorded at a rate of 1Hz.

5.3 *Data Processing*

The following steps were taken in the processing of the TFM data:

- Data was downloaded from the G-858 magnetometer to a computer
- Data was checked for integrity and processed in Surfer
- A spike removal and high-pass filter were applied
- The total field and gradient data were plotted on a contour map and compared
- Total field and gradient data were analysed together with a background satellite image and any consistent features were identified
- The identified features were extrapolated to form the complete layout of the garden to match the original 1832 plans

6. COMMENTS ON RESULTS

The image in Appendix 1 is a high-pass filtered contour map of the total magnetic field with the interpretation overlaid on top. The image in Appendix 2 is a contour map of the magnetic gradient. The maps show a number of linear features that, when put together, appear to match the structure of the layout displayed in the 1832 plan.

It is important to note that these features were delineated by analysis of a number of plots of the data, including total field, gradient, various filters and aerial photographs. These features are therefore not easily discernable by an untrained eye on any one of the maps alone.

The linear features displayed in the data may represent the edges of each garden "block", or any part of the path between each block. This error margin (estimated to be 2-3m) may explain why the eastern and western blocks mapped out on the contour plot are larger than the centre blocks – the boundaries identified in the outer blocks may be at the higher end of the error margins while the boundaries of the centre blocks may be at the lower end of the error margins (see Appendix 3).

The northern and eastern extents of the garden area fall outside of the range of the survey area and therefore there is no data available to delineate these boundaries.

7. CONCLUSIONS

The TFM survey was successful in delineating enough features of the gardens to facilitate approximate placement of the garden to an accuracy of ±3.0m.

While none of the features gave a particularly strong magnetic response, put together they fit the garden plan reasonably well. The main uncertainty with the features is whether they represent the boundaries of the garden blocks or the paths that separate them.

The northern and eastern boundaries of the garden were outside the range of the survey and were therefore unidentifiable, however, it would be reasonable to extrapolate their location based on the dimensions of the features that were located.

8. LIMITATIONS OF REPORT

This report has been prepared for the use of **APP Corporation Pty. Ltd** in accordance with general accepted Consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has not been prepared for the use by parties other than the client, the owner and their respective consulting advisors. It may not contain sufficient information for purposes of other parties or for other uses.

This report was prepared on completion of the field work and is based on conditions encountered and reviewed at the time of preparation. Alpha Geoscience disclaims responsibility for any changes that might have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Whilst to the best of our knowledge, information contained in this report is accurate at the date of issue; conditions on the site (including the depositing and removal of contamination) can change in a limited time. This should be borne in mind if the report is used after a protracted delay.

APPENDIX 1 - CONTOUR MAP OF TOTAL MAGNETIC FIELD WITH INTERPRETATION

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Australia
Phone +61 2 9584 7500
Fax +61 2 9584 7599
Email info@alpha-geo.com.au

Description:

Solid lines indicate located garden boundaries and pathways based on information from the 1832 garden plan. These lines could mark either the edges of garden beds or the paths between them. This is why they do not appear evenly spaced. The dashed lines indicate inferred garden boundaries and pathways which are not visible in the total field magnetic data.

Key:

visible feature

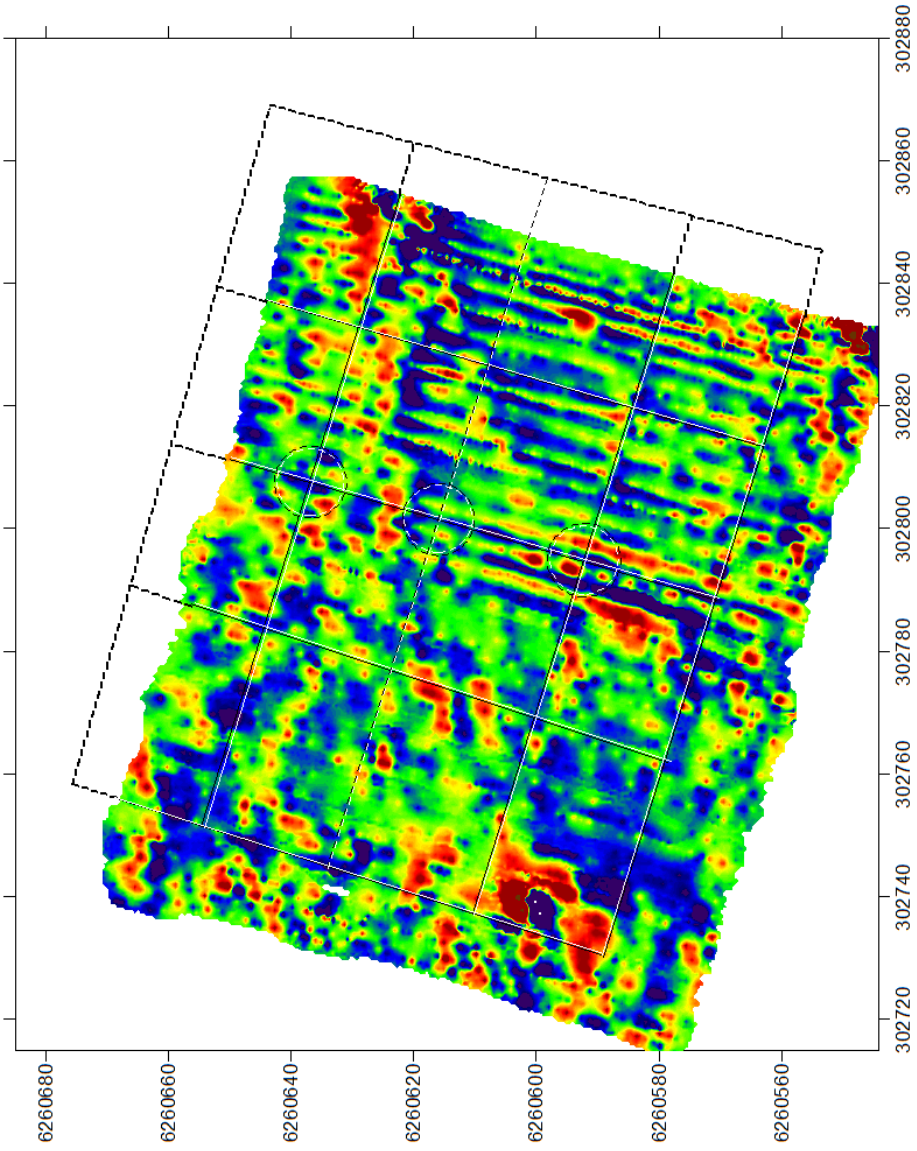
inferred feature

PROJECT: Bungarribee Gardens
PROJECT ID: AG-238
CLIENT: APP Corporation
METHOD: Total Field Magnetics
INSTRUMENT: Geometrics G-858
ACQUIRED BY: George Brabec
SURVEY DATE: 01/05/2008

PROCESSED BY: George Brabec
PROCESSING DATE: 02-05/05/2008
POSITIONING: DGPS
DATA GRIDDING: Surfer v8.08
GRIDDING METHOD: Krigging
GRID CELL SIZE: 0.30m x 0.30m
GRIDDING RADIUS: 4m

Alpha GeoScience

Total Field Magnetic Map of Bungarribee Gardens
Total Field - High-Pass Filtered



APPENDIX 2 - CONTOUR MAP OF MAGNETIC GRADIENT WITH INTERPRETATION

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Description:

Solid lines indicate located garden boundaries and pathways based on information from the 1832 garden plan. These lines could mark either the edges of garden beds or the paths between them. This is why they do not appear evenly spaced. The dashed lines indicate inferred garden boundaries and pathways which are not visible in the total field magnetic data.

Key:

visible feature

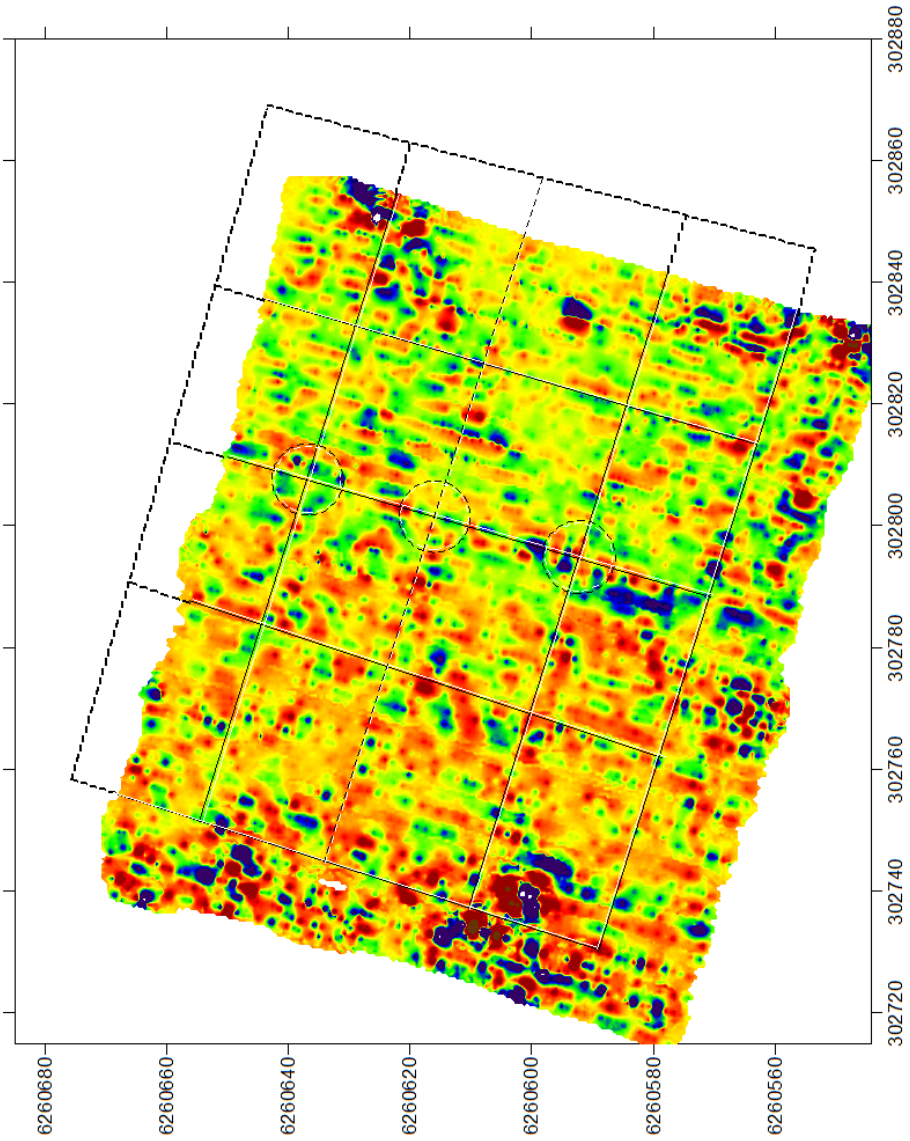
inferred feature

PROJECT: Bungarribee Gardens
PROJECT ID: AG-238
CLIENT: APP Corporation
METHOD: Total Field Magnetics
INSTRUMENT: Geometrics G-858
ACQUIRED BY: George Brabec
SURVEY DATE: 01/05/2008

PROCESSED BY: George Brabec
PROCESSING DATE: 02-05/05/2008
POSITIONING: DGPS
DATA GRIDDING: Surfer v8.08
GRIDDING METHOD: Krigging
GRID CELL SIZE: 0.30m x 0.30m
GRIDDING RADIUS: 4m

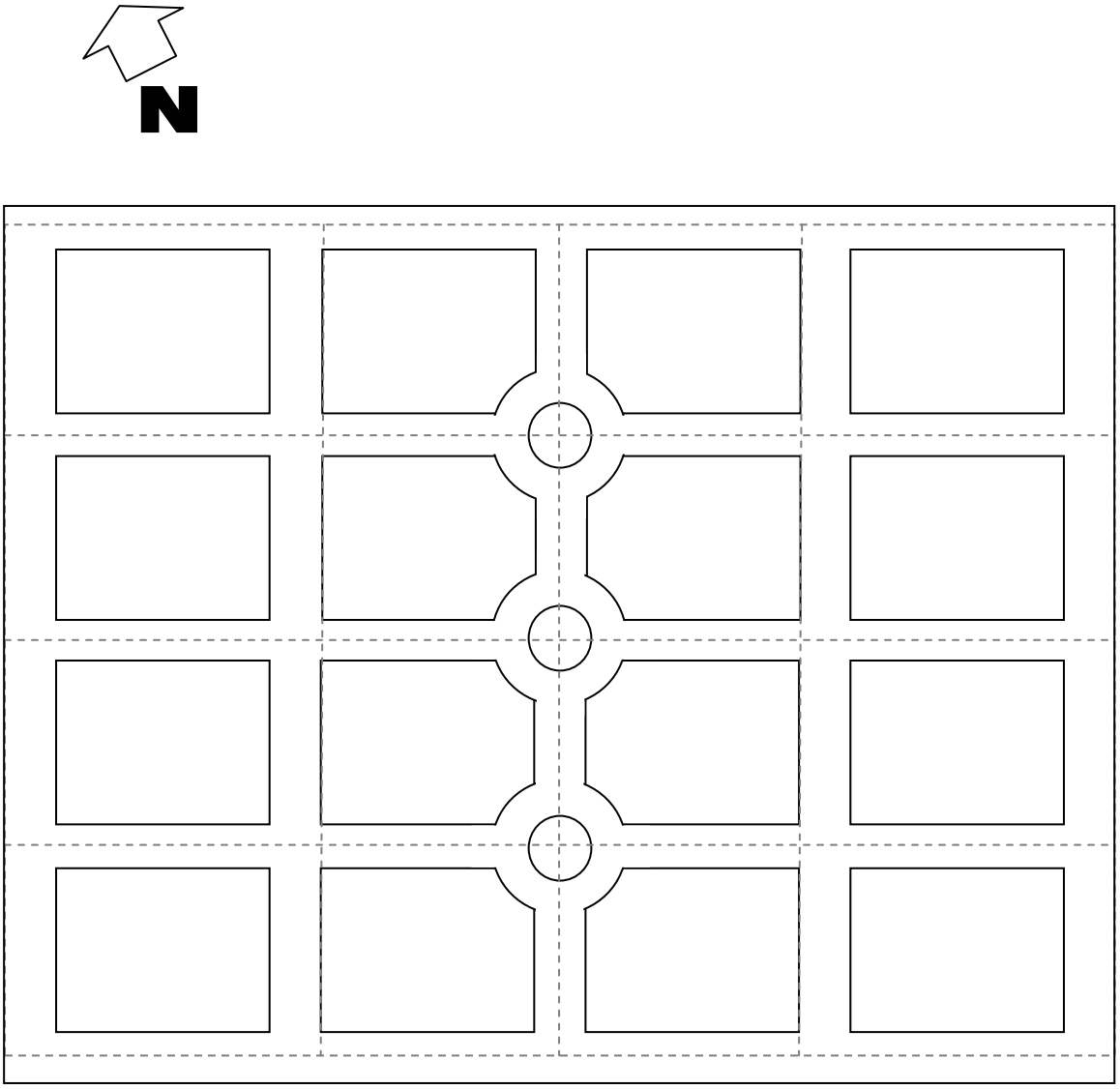
Alpha GeoScience

Total Field Magnetic Map of Bungarribee Gardens
Gradient - High-Pass Filtered



APPENDIX 3 - MODEL OF GARDEN BLOCKS FITTING UNEVEN SPACING OF THE LINEAR FEATURES

Dashed lines represent the model derived from the TFM survey results. Solid lines represent boundaries of garden paths and blocks.



APPENDIX 4 - ALPHA GEOSCIENCE – CURRICULUM VITAE

Alpha Geoscience was established in 1997 to offer high sensitivity geophysical tools and expertise as an alternative to intrusive investigations in the following areas:

- **Environmental Services** — Including the mapping of buried structures, site assessments and the detection of chemical pollutants.
- **Ordnance Services** — The location of buried unexploded ordnance (UXO), site assessments and sample surveys to determine extent of pollution. Alpha Geoscience is a member of the Defence UXO Panel.
- **Engineering Services** — Assisting civil mining and construction engineers with sub surface investigations, especially where intrusive investigation is difficult and costly to undertake.
- **Forensic Geophysics** — The location of buried gravesites and other buried objects for the police and other crime agencies.
- **Mining and Exploration** — Assist mining and exploration companies with near surface investigations.
- **Training** — Provides training courses in high-resolution magnetics, electro-magnetics, seismic refraction and ground-penetrating radar for clients who wish to undertake surveys themselves.
- **Project Management** — Is an intricate part of all projects and Alpha Geoscience has expertise and experience in setting up, running and reporting on both major and minor projects worldwide.
- **Research and Development** — Alpha Geoscience has been involved in running a number of research and development projects including the development of a multi-sensor geophysical instrumentation package for the horizon control of a coal-mining machine.

The types of techniques offered by Alpha Geoscience include high sensitivity magnetics, ground penetrating radar, time or frequency domain electro-magnetics, resistivity mapping and seismic refraction and reflection techniques. These services combined with the digital processing of the data to produce colour images of the site and the interpretation of the data, gives high-resolution detail of the sub surface on the site. This data can be imported into Geographical Information Systems (GIS) for future reference and auditable documentation.

Alpha Geoscience also offers the services of processing and interpretation of data in Sydney with the data being downloaded from the field via the Internet.

Alpha Geoscience is based in Sydney Australia and is capable of mobilising to any part of the world with very short notice. We have experience in operations throughout Australia, North America, Europe and South East Asia.

Alpha Geoscience is offering its services and consultation so that the client obtains the best technology for the particular target being investigated. Whether it is an ordnance item or environmental pollution plumes, it has the technical expertise to provide the right solution.