Non-Indigenous Archaeological Assessment

Barangaroo Stage 1

Central part of the Stage 1 study area with Sussex Street on the left and the Grafton Bond in the middle ground and left. Kerry & Co., ML, SLNSW, PXA 449.

Report to

Lend Lease (Millers Point) Pty Ltd

June 2010

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EXECUTIVE SUMMARY

RESULTS

The study area contains a mixture of maritime infrastructure, shipbuilding and industrial land uses. The significant archaeological resource survives in the eastern 70m or so of the study area.

The approved Concept Plan provides for the Barangaroo Stage 1 site to be developed for a range of uses including commercial, retail, residential and public recreation. The Concept Plan also makes provision for a large basement within Blocks 1-4 and for the excavation to create an enlarged Southern Cove. In this regard, the redevelopment of the site does not anticipate or provide for the retention of any archaeology *in situ*. The impact on the archaeology within the four development blocks was outlined in the two previous archaeological reports for the whole of the Barangaroo redevelopment.[1]

The archaeological remains in Blocks 1, 2, 3 and 4 will be impacted by the excavation for basements. A program of archaeological investigation will need to be undertaken to record aspects of the archaeological remains prior to development of the site. This should be undertaken in accordance with best practice standards.

Archaeological Potential

Much of the study area was originally below the high water mark with staged private reclamations from the 1820s, early 1830s and 1840s. Block 1 is considered to have no significant archaeological remains as it appears to be mostly limited to cut-off timber piles. Blocks 2, 3 and 4 contain a range of archaeological resources:

- Early maritime infrastructure (1810s-1830s) with associated stores and reclamation processes, notably Portion 20 associated with Prosper de Mestre and Francois Girard.
- Henry Bass' early shipyard.
- The AGL gasworks (1839-1921) which is highly contaminated.
- Mid 19th-century wharfage which was augmented, demolished and upgraded through time until it became the Grafton wharf which was associated with the nearby bond stores.
- New wharfage in the 1880s which involved the raising of street levels (0.60m) to accommodate larger ships.
- It is noted that some of northern sections of the eastern part of the study area will contain evidence of the original foreshore.

The study area has a moderate to high level of archaeological potential across most of the study area.

Heritage Significance

The heritage significance of the following was assessed as part of writing this report.

Archaeological remains which do not reach the Local significance threshold

- Cut off timber piles of late 19th-century and 20th century wharfage at some distance from seawall. These are not included with similar piles under the Local significance because they do not have their relationship to the land and seawalls we and it is unlikely we could relate them to any specific wharf or phase or actually be able to record them in a meaningful way.

Archaeological remains of Local Significance within the Barangaroo Stage 1 Study Area

[1] Austral Archaeology 2009, 2010

- Most of the 19th-century wharfage, yards and stores, and reclamation where we can relate it to the foreshore and reclamation phases and associated storehouses - Blocks 2 and 3.
- The reduced ability to record the remains of the gasworks, the extensive rebuilding which will have removed early phases of technology and the excavation of the western part of Block 4 means that it potentially does not reach the State significance threshold.

Archaeological remains of potential State significance within the Barangaroo Stage 1 Study Area

- Possibly the early remains of the maritime infrastructure and phased reclamation most likely established by Prosper de Mestre and then occupied by Francois Girard. This has significance as both a relatively early example of maritime construction and foreshore remodelling and may allow us to further our understanding of reclamation prior to the building of semi-circular quay in 1838 by Colonel Barney.
- Henry Bass' shipyard but there may be issues of integrity arising from contamination that make this significance hard to realise.

Impact from Proposed Development

The excavation for the basement carparks below the new buildings will remove all archaeological deposits within Blocks 1, 2, 3, and 4. The perimeter retention system will be excavated initially around the outside of the basement with dewatering also required. The enlarged southern cove may have some additional impacts on the gasworks archaeology and remains of a jetty in Block 4. It is noted that Block 4 is covered by the DECCW declaration.

RECOMMENDATIONS

1. A program of archaeological investigation should be undertaken and an excavation director appointed to manage the program.
2. A Research Design and Management Strategy report needs to be written to guide this investigation. This report needs to draw on a range of Heritage Council guidelines.
3. Testing of areas of impact within the study area should be carried out to determine the nature and depth of archaeological remains and to assist the development of an archaeological management strategy.
4. Based on the archaeological integrity of the remains, a program of archaeological salvage and recording will be required. Salvage would include sampling sections of the site, such as:
    - Recording a number of sections of the later 19th-century wharfage, notably the Grafton wharf.
    - The maritime infrastructure, stores and reclamation in Portion 20, Block 2.
    - If possible the remains of Henry Bass' early shipyard and associated reclamation and expansion of the site, but dependent on contamination issues.
    - The nature of the area's reclamation fills should be investigated – these will be present throughout the study area.
    - Evidence for the early topography and natural landform and how this was modified through time.
5. Develop a strategy for recording as much of the gasworks as possible within the constraints of the contamination to human health and safety (Appendix 1).
6. The archaeological sampling and recording need to be undertaken according to Heritage Branch, Department of Planning guidelines and best practice archaeological methodologies. This will then feed into the future interpretation and produce a detailed record of the site.

7. The client or the Barangaroo Delivery Authority will need to provide a repository for the artefacts recovered from the site.
8. An interpretation plan is to be developed for the site, and the results of the archaeological program, with all its types of evidence, needs to be incorporated into the interpretation plan. The archaeologists need to have a central role in the development of ideas and themes and interpretative concepts.

Contents

Appendices

Document Status

Name	Date	Purpose	Author	Approved
DRAFT Issue 1	7/5/2010	Draft for LL	Mary Casey	Tony Lowe
Final draft	24/5/2010	Final draft	Mary Casey	Tony Lowe
Final	26/5/2010	Final for EA submission	Mary Casey	Tony Lowe
Final (2)	14/6/2010	Minor BDA requirements	Mary Casey	Tony Lowe

1.0 Introduction

1.1 Background

This archaeological assessment is an analysis of the non-indigenous archaeological potential of the Stage 1 development area at Barangaroo Development Blocks 1 to 4, (Figs 1.1, 1.2). The Barangaroo development is to include commercial, retail and residential buildings and public recreational uses.

The development of Barangaroo is part owned and currently controlled by the Barangaroo Delivery Authority (BDA). Lend Lease is the selected development proponent for the redevelopment of Barangaroo, Stage 1.

The project has been classified as a 'major project' to be determined under Part 3A of the EP&A Act. This archaeological assessment will determine the nature and heritage significance of any archaeological remains and put forward recommendations to record or mitigate impacts on these remains depending on the nature of the development in their vicinity.

The redevelopment of Barangaroo is proposed to be undertaken in stages:

1. Preliminary works involves the demolition of above ground structures and site establishment. Archaeological testing will be undertaken at this time as part of the Environmental Assessment. The aim of the testing is to confirm the accuracy of the model of the site's archaeological potential and refine our approach to dealing with the most significant archaeological resource.
2. Archaeological salvage works are to commence once the project approval has been given and in conjunction with the start of works such as the perimeter retention system. It is currently expected that the archaeological program for Stage 1A/1B basement will be completed prior to bulk excavation commencing in February 2011.
3. Archaeological work for Stages 1C and 1D is likely to commence after the initial stages are completed but prior to bulk excavation.

Lend Lease is submitting separate Project Application for Blocks 1 to 4 and this report aims to identify the archaeological resource within that part of the Barangaroo area and provide a management strategy for the archaeological resource.

1.2 Site Description

Barangaroo Stage 1 is located along the eastern side of Darling Harbour precinct with Hickson Road forming the eastern boundary of the study area and Shelly Street the southern end. The western boundary is within the existing concrete wharfage and the northern border is also within the wharfage. The Stage 1 site comprises Lots 3, 5 and 6 in DP 876514. Development blocks 1 to 4 form the basis of the Stage 1 development (Figs 1.1, 1.2). There is an area of contamination associated with the operation of the historic gasworks (c1840-1910s) that was located within the northern part of the site (Blocks 4 and 5). The Stage 1 redevelopment will provide for a range of commercial, residential, tourist, retail and community spaces as well as 3ha for public recreation. Stage 1 also includes basement carparking and an enlarged southern cove.

The existing site consists of the 1960s concrete wharfage along Hickson Road. This was recently used for container wharfage, World Youth Day and for docking of cruise ships.

Figure 1.1: Barangaroo Stage 1 (red outline) showing the basement (purple outline) and the DECCW declared area (blue outline). Historical Atlas of Sydney, City of Sydney Archives

1.3 Previous Archaeological and Heritage Reports

There are two main archaeological reports that were commissioned by the Barangaroo Development Authority from Austral Archaeology.

Barangaroo Archaeological Strategy, Final Report, 2009, by Austral Archaeology for the Barangaroo Delivery Authority

Barangaroo Archaeological Assessment & Management Plan 2010 by Austral Archaeology for the Barangaroo Delivery Authority

These archaeological reports are superseded for Barangaroo Stage 1 by this Barangaroo Stage 1 specific Archaeological Assessment and the Research Design which will be written to follow on from this Assessment.

1.3.1 Reports relating to the gasworks site

Archaeology & Heritage 2004 *Archaeological recording of the Annulus of 1882 gasholder and details of the 19th century gasmaking, part of former AGL Site 30-34 Hickson Road, Sydney*, for Bovis Lend Lease.

Archaeology & Heritage 2003 *Archaeological recording and excavation, former AGL Site 38 Hickson Road, Sydney, rock shelf at rear*, for Bovis Lend Lease.

Broomham, Rosemary 2007 *Land at Millers Point, ownership and usage*.

Broomham, Rosemary 1987 *First Light, 150 years of gas*, Hale & Iremonger, Marrickville, Sydney.

Godden Mackay Logan 2001 *Conservation Management Plan, 30-38 Hickson Road, Sydney*, for Delmo Pty Ltd.

Godden Mackay Logan 1999 *Archaeological Assessment, Former AGL Site, Hickson Road,* for Delmo Pty Ltd.

1.3.2 Darling Walk, Darling Harbour

The Archaeological Assessment and the Preliminary Results of the excavation program are available on the Casey & Lowe webpage: http://www.caseyandlowe.com.au/sitedw.htm. The overall reporting for this site is in progress. The Darling Walk excavation is relevant for the analysis of the Barangaroo Site as it has considerable similarities in the way the foreshore was reclaimed and built up and the development of the model of archaeological potential and significance we undertook for that site. See Section 1.4.3.

1.4 Methodology

1.4.1 Reporting

The production of an Archaeological Assessment is a systematic methodological process that involves a series of phases:

1. Historical research utilising primary material such as maps, pictorial material, directories and council records, and secondary sources. Through this process sub-surface remains may be located on plan and an analysis made of their historical development, construction and use. This provides a picture of the likely extent of archaeological remains and a mini-picture of land use for the site within the context of a wider land use scenario.
2. This analysis is then compared to the extant structures and vacant spaces of the site. From this synthesis an assessment can be made of the nature and extent of existing archaeological deposits. In addition archaeological deposits associated with extant structures can be identified. This leads into a discussion of the archaeological potential of the site.

3. The heritage significance of the site's archaeological deposits is addressed through criteria listed in the NSW *Heritage Act* 1977 (amended) and implemented through the *Burra Charter* and the *State Heritage Inventory Program*. They include the nature and degree of heritage significance such as historical, social, research potential, rarity and representativeness and other types of significance.
4. Based on this assessment of archaeological potential and significance, policy and recommendations are produced regarding the management of the archaeological deposits and mitigating actions in light of a proposed development.
5. The above process is based on the *Burra Charter* guidelines and the *Archaeological Assessment Guidelines* for the establishment of heritage significance and the development of a conservation policy. Through this methodology the archaeological resource will be best served and delays to or interference with development proposals will be minimised.

1.4.2 Map Overlays

Lend Lease commissioned Rygate & Co, surveyors, to do a series of baseline overlays onto the main historic plans to inform this Archaeological Assessment: Harper 1823, Russell 1834, Woolcott & Clarke 1854, *Trignometrical Survey* 1865, Wansbrough 1875, Dove's 1880 plan, The *Metropolitan Detail Series* 1891, and a 1903 plan. These are included in the report in Sections 2 and 3. These overlays have informed the study areas Casey & Lowe have marked on a range of other historic plans. We note that the accuracy of the overlays is always affected by the accuracy of the original map and the elements into which the modern overlay can be keyed into. On the earlier plans these are few and therefore there is a level of inaccuracy in the 'fit' between the two plans. Generally the east-west fit is reasonably accurate while there is likely to be some north-south shift. These inaccuracies are factored into the assumptions we make about the site and the potential surviving archaeological resource.

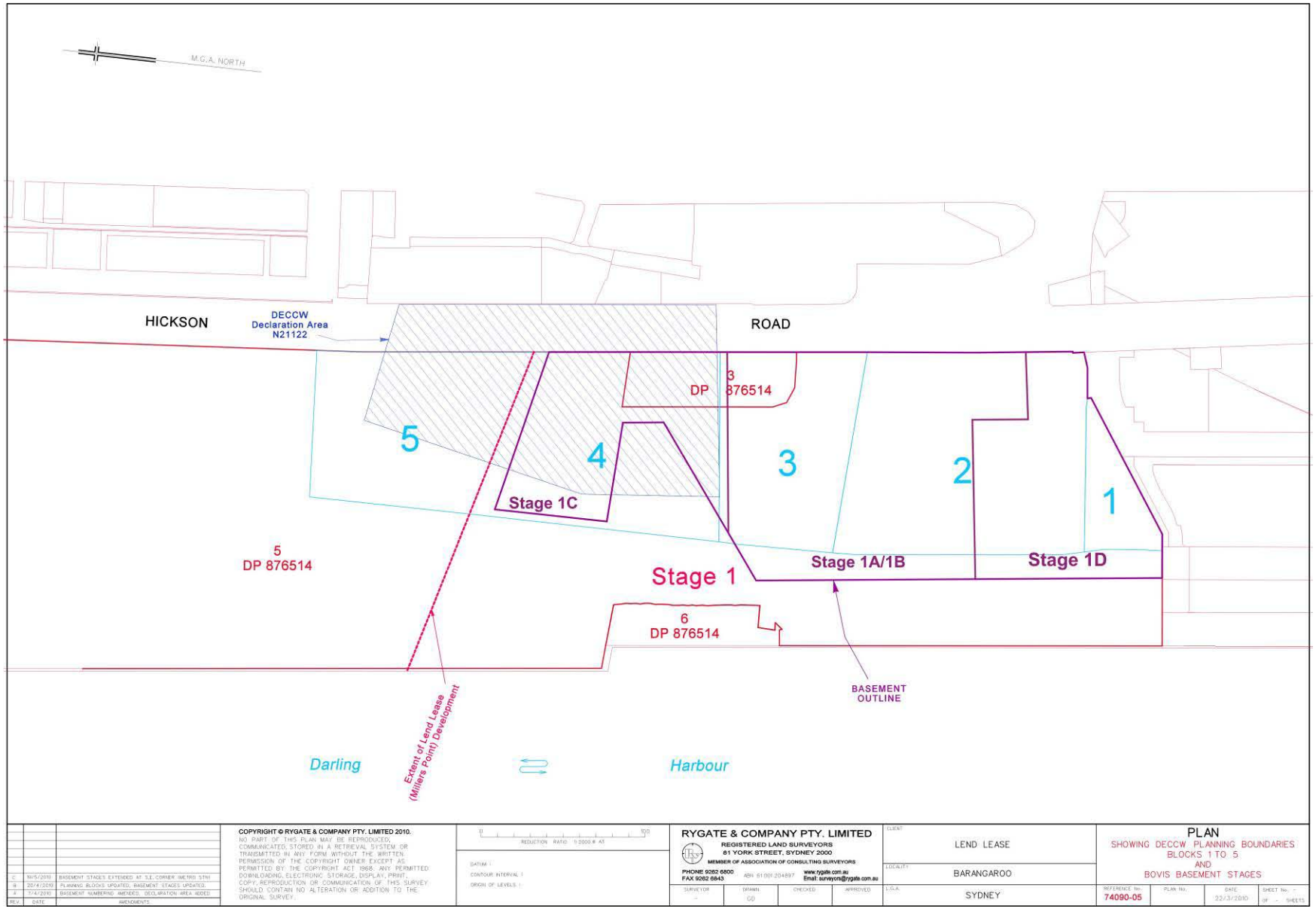


Figure 1.2: Plan showing the five development blocks, basement excavations (purple lines), and the main areas of contamination (hatched). Rygate & Co for Lend Lease.

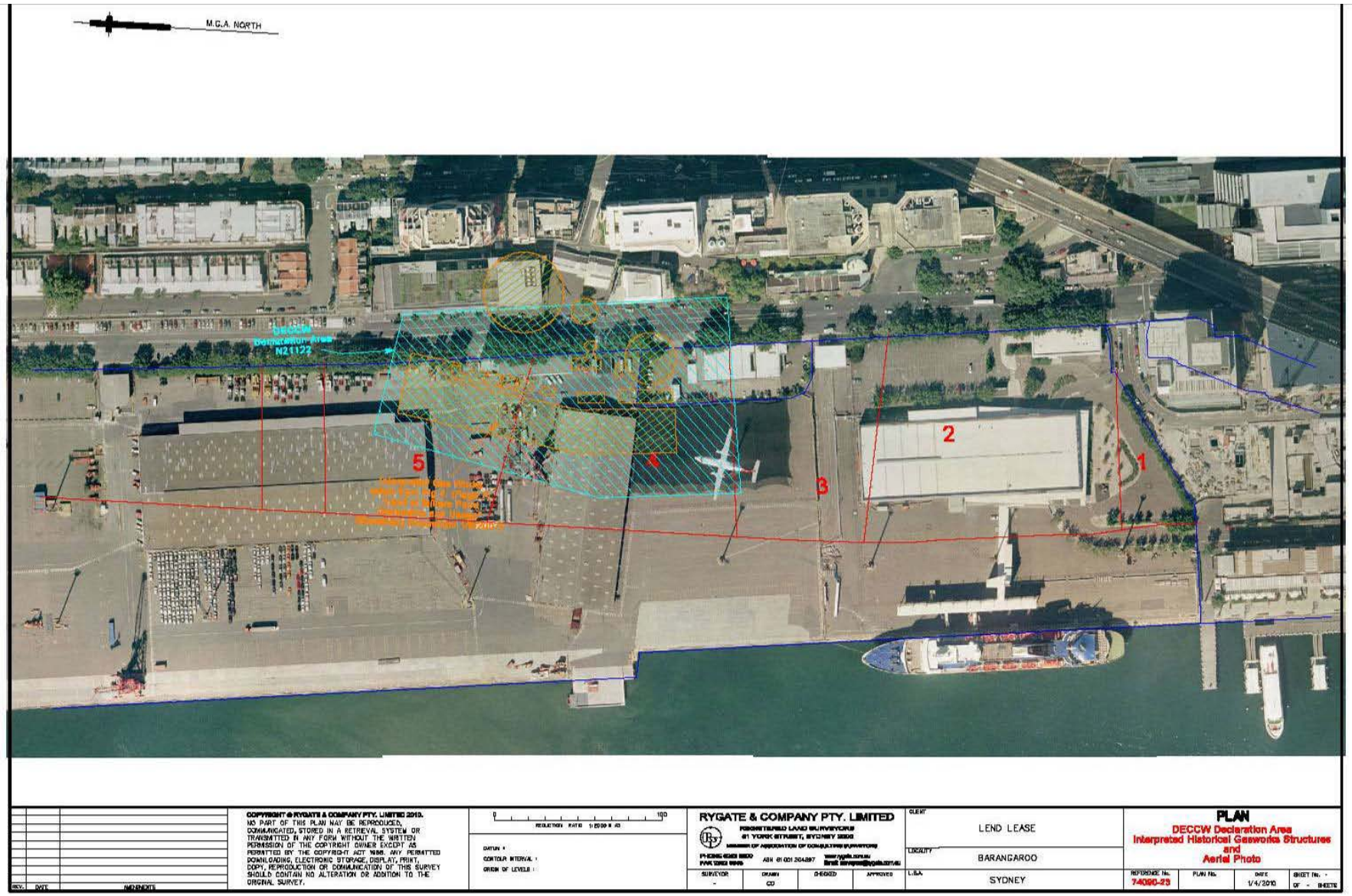


Figure 1.3: Aerial photo showing the location of Blocks 1 to 5 and the identified contaminated areas (blue hatched lines). Rygate & Co for Lend Lease

1.4.3 Comparative Sites

The 5-month archaeological project Casey & Lowe undertook for Lend Lease at Darling Walk, Darling Harbour has strongly influenced our understanding of this type of foreshore development and the nature of how a site was built up by phases of reclamation. One of the main underlying assumptions with this type of site is that the aim was usually to increase the amount of usable land which involved reclaiming and raising levels to keep the water out. This is crucial to understanding how we arrive at conclusions in Section 4.1. For an overview of the results of this Darling Walk site see: http://www.caseyandlowe.com.au/sitedw.htm. The other most relevant site is the KENS site. This excavation report is near completion and we hope to have access to the detailed results at that site prior to undertaking the excavation phase. For general sites in the CBD see Section 4.

1.5 Proposed Development

The area of the proposed development is shown in Figures 1.1, 1.2, 1.3. The existing buildings and wharfage will be demolished and commercial buildings erected in the eastern half of the study area, along with a basement carparking. The basement construction will be staged to accommodate the development. There will be public open space along the foreshore within the Stage 1 study area.

European or Non-indigenous archaeological remains of local or State significance are protected under Sections 139 and 140 of the *Heritage Act*. Where the development is being undertaken under a Part 3A process there is no requirement to apply for a S140 approval but there is an expectation that the required archaeological work will conform to best practice established by the Heritage Council and their various guidelines (see Section 1.6.1 below). The Heritage Branch will be required to review relevant documentation and provide advice as to whether it is acceptable as per the Commitments, Modification 3.

1.6 Statutory Constraints

1.6.1 Part 3A, Environmental Planning and Assessment Act, 1979

Where the proponent has decided to apply for development consent under Part 3A of the *Environmental Planning and Assessment Act* (EP&A) they may be subject to different approval processes to developments covered by Part 3 (or other Parts) of the Act. In particular, the Minister for Planning may become the Consent Authority for certain applications. The Barangaroo site is covered by Part 3A because it is listed as a State Significant site under Schedule 3 of the State Environmental Planning Policy (Major Development) 2005 and hence the Minister is the Consent Authority. This report forms part of the documentation necessary for a Part 3A application.

The Barangaroo development site currently has a Part 3A concept plan approval which covers the archaeological areas which are the subject of this report. This Stage 1 Assessment & Management Strategy report forms part of the Environmental Assessment Lend Lease is completing for the Project Approval under Part 3A.

Comber Consultants is writing a report on the Aboriginal archaeology for the Stage 1 development. While Aboriginal archaeology has not been specifically identified in the Director-Generals Requirements (DGRs) or the Commitments (Modification 3) Casey & Lowe and Comber Consultants experience at the nearby Darling Walk site where the remains of a midden were found suggests that this site may also contain Aboriginal relics or artefacts as protected under the National Parks Act. To make sure these are covered by the Part 3A Project Approval a report and management plan has been undertaken.

What does Part 3A do?[2]

Part 3A consolidates the assessment and approval regime for all major projects previously addressed under Part 4 (Development Assessment) or Part 5 (Environmental Assessment) of the Act. Part 3A applies to major State government infrastructure projects, development previously classified as State significant, and other projects, plans or programs of works declared by the Minister. The amendments provide a streamlined assessment and approvals regime for major infrastructure and other projects of State or regional significance. They also improve the mechanisms available under the EP&A Act to enforce compliance with approval conditions or the Act. The new provisions will continue to ensure the appropriate level of community consultation and environmental assessment is undertaken, based on the level of risk or community concern.

The client will respond to the Director-General's Requirements with a set of Commitments. The Commitments relating to Non-indigenous Archaeology will be based on the recommendations provided at the end of this report. A set of Commitments has already been issued for this project under Modification 3 for Barangaroo.

The relevant Commitments for Archaeology and Heritage are:

60. All affected potential historical archaeological sites or 'relics' of Local and State significance are to be subject to professional Archaeological Assessment in accordance with Heritage Council guidelines. The Assessment must address both terrestrial and maritime archaeological resources and must be prepared by a practitioner (or practitioners) with both terrestrial and maritime experience. The Assessment must consider the desirability and staging of any proposed archaeological excavation and/or recording before the construction works commence and also other mitigation strategies such as archaeological monitoring (or 'watching brief') during construction works.

60A. A Research Design including an Archaeological Excavation Methodology will be prepared in accordance with Heritage Council guidelines for each site which is to be impacted by the proposal. Those documents will be prepared for the approval of the Director of the Heritage Branch, Department of Planning. The Archaeological Excavation Director will be a qualified archaeologist, and will meet the current Excavation Director Criteria for State significance sites as published by the NSW Heritage Council.

60B. After archaeological works are undertaken, a copy of the final excavation report(s) will be prepared and lodged with the Heritage Branch, Department of Planning, to the State Library of NSW and also to the Local Studies Library in the City of Sydney. The information within the final excavation report will be in accordance with the Heritage Branch requirements.

60C. A repository for the relics salvaged from any historical archaeological excavations will be nominated by the Barangaroo Delivery Authority.

61. An appropriately experienced and qualified heritage practitioner will be engaged to prepare an Interpretation Plan for the whole Barangaroo site in accordance with the NSW Heritage Office Heritage Interpretation Policy. The Plan will explore various cultural, social and environmental themes related to the site including, but not limited to:
    - The natural landscape
    - Aboriginal history
    - Manipulation of the landscape

[2] DIPNR Circular: Commencement Part 3A (Major Projects) of the EP&A Act, PS05-006, issued 29 July 2005

- Maritime industry, trade and commerce
- Labour, workers and social movements
- Archaeology

The plan will make recommendations for:

- Public Art
- Naming
- Interpretive Signage and Installations
- Display of Archaeological Deposits
- Built Form Strategies

The plan will also include strategies for:

- Staged Implementation
- Ownership
- Identification of Responsible Stakeholders
- Future Maintenance
- Any individual demolished, dismantled or buried heritage items;
- Historic/significant buildings retained within the precinct; and
- The public domain areas of the precinct.

Under the definitions of Part 3A:

approved project means a project to the extent that it is approved by the Minister under this Part, but does not include a project for which only approval for a concept plan has been given.

project means development that is declared under section 75B to be a project to which this Part applies.

75U Approvals etc legislation that does not apply

The following authorisations are not required for an approved project (and accordingly the provisions of any Act that prohibit an activity without such an authority do not apply):

(c) an approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*,

(d) a permit under section 87 or a consent under section 90 of the *National Parks and Wildlife Act 1974*,

A reference in this section to an approved project includes a reference to any investigative or other activities that are required to be carried out for the purpose of complying with any environmental assessment requirements under this Part in connection with an application for approval to carry out the project or of a concept plan for the project.

1.6.2 Statutory and Non-statutory Guidelines

The management of heritage sites in NSW should conform to the requirements of the *Burra Charter* of Australia ICOMOS. Many of the following guidelines provide for best practice conservation approaches and can be used to inform all the management of the archaeological remains. There are a range of archaeological guidelines which inform the management of the place:

Archaeological Assessment Guidelines, NSW Heritage Office, Department of Urban Affairs & Planning, 1996. A new draft of this has been prepared but not yet published.

Assessing Significance for Archaeological Sites and 'Relics', Heritage Branch, Department of Planning, 2009.

NSW Heritage Manual, NSW Heritage Office, Department of Urban Affairs & Planning, 1996.

Historical Archaeological Investigations: A Code of Practice, NSW Department of Planning, 2006.

Historical Archaeological Sites, Investigation and Conservation Guidelines, Department of Planning and NSW Heritage Council, 1993.
Excavation Director's Assessment Criteria, NSW Heritage Office.
ICHAM Charter, The ICOMOS Charter for the Protection and Management of Archaeological Heritage, ICOMOS International, 1990.
Recommendation on International Principles Applicable to Archaeological Excavations, UNESCO, 1956.
Heritage Interpretation Policy and Guidelines, Heritage Information Series, NSW Heritage Office, August 2005.
Photographic Recording of Heritage Items, Heritage Information Series, NSW Heritage Office, 2006.

1.7 Authorship

The historical background (Section 2) for this assessment was researched and written by Dr Rosemary Annable, historian and archaeologist. Existing research on the gasworks by Dr Rosemary Broomham was the basis for our understanding of the development and operation of the gasworks; no additional historical research was undertaken on the gasworks for this report other than to review a range of reports on the gasworks site. Section 3 was written by Dr Mary Casey, Director, Casey & Lowe and Abi Cryerhall, Casey & Lowe. Cos Coroneos, Cosmos Archaeology, maritime archaeologist, wrote Section 3.2 and contributed to Section 4.2. Some overlays onto the historic plans were produced by Abi Cryerhall, Casey & Lowe while the base maps were undertaken by Rygate & Co. surveyors. Dr Bernadette McCall, Casey & Lowe, undertook proofing and Robert Maxwell assisted with analysis of the gasworks. The report was reviewed by Tony Lowe, Director, Casey & Lowe Pty Ltd.

1.8 Acknowledgements

Paula Mottek and Michelle Mason, Lend Lease Point commissioned and project managed this report. Warwick Bowyer, Lend Lease, provided plans and descriptions of the proposed development, copies of geotechnical reports and the Remediation Action Plan (RAP) on remediation and considerable other assistance. The overlay plans by Rygate & Co were important for understanding the extent and nature of the potential archaeological resource within the study area. Maritime archaeologists Cos Coroneos provided considerable assistance in understanding the nature of the maritime archaeological resource and its significance. Anne Bickford, Archaeology and Heritage Pty Ltd generously loaned copies of various archaeological and heritage reports on the gasworks.

1.9 Limitations

There was sufficient time and funding to complete this report to a quality standard. We had to supplement the limited site specific research undertaken for previous reports on the archaeology of Barangaroo.[3] The absence of an Archaeological Zoning Management Plan for Darling Harbour makes it difficult to determine the nature of the surviving resource for this area generally which can affect the values identified in the Statement of Significance but this report is considered to be robust enough to deal with this situation.

[3] Austral Archaeology 2009 and 2010

1.10 Terminology

Historical Archaeology (Non-Indigenous/European)
Historical Archaeology (in NSW) is the study of the physical remains of the past, in association with historical documents, since the British occupation of NSW in 1788. As well as identifying these remains the study of this material can help elucidate the processes, historical and otherwise, which have created our present surroundings. Historical archaeology includes an examination of how the late 18th and 19th-century arrivals lived and coped with a new and alien environment, what they ate, where and how they lived, the consumer items they used and their trade relations, and how gender and cultural groups interacted. The material remains studied include:

Archaeological Sites:

- below ground: these contains relics which include building foundations, occupation deposits, rubbish pits, cesspits, wells, other features, and artefacts.
- above ground: buildings, works, industrial structures and relics that are intact or ruined.
- cultural landscapes: major foreshore reclamation
- maritime sites: infrastructure and shipbuilding
- shipwrecks
- structures associated with maritime activities.

Archaeological Potential
Archaeological potential is here used and defined as a site's potential to contain archaeological relics which fall under the provisions of the *Heritage Act* 1977 (amended). This potential is identified through historical research and by judging whether current building or other activities have removed all evidence of known previous land use.

Archaeological Site
A place that contains evidence of past human activity. Below ground sites include building foundations, occupation deposits, features and artefacts. Above ground archaeological sites include buildings, works, industrial structures and relics that are intact or ruined.

Archaeological Investigation or Excavation
The manual excavation of an archaeological site. This type of excavation on historic sites usually involves the stratigraphic excavation of open areas.

Archaeological Monitoring
Archaeological monitoring is recommended for those areas where the impact of the works is not considered to mean the destruction of significant archaeological fabric. Nevertheless the disturbance of features both suspected and unsuspected is possible. In order to provide for the proper assessment and recording of these features an archaeologist should inspect the works site at intervals they consider to be adequate and to be 'at call' in case the contractor uncovers remains that should be assessed by the archaeologist.

It is not anticipated that monitoring would impact on the planned works or unduly hold up the contractors' work schedules. If recording of features is necessary it would be carried out as quickly as possible so that any time delays are minimised.

Monitoring is a regular archaeological practice used on many building and development sites.

Research Design
A set of questions which can be investigated using archaeological evidence and a methodology for addressing them. A research design is intended to ensure that archaeological investigations focus on genuine research needs. It is an important tool that

ensures that when archaeological resources are destroyed by excavation, their information content can be preserved and can contribute to current and relevant knowledge.

Research Potential
The ability of archaeological evidence, through analysis and interpretation, to provide information about a site that could not be derived from any other source and which contributes to the archaeological significance of that site and its 'relics'.

Relic
Means any deposit, artefact, object or material evidence that:

(a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and
(b) is of State or local heritage significance.
(NSW *Heritage Act 1977*, Definitions, Part 1.4)

1.11 List of Illustrations

Section 2

Section 3

Section 4

2.0 History of Barangaroo Stage 1

The area encompassed by Stage 1 of the Barangaroo development comprises much of the former Section 67 of the City of Sydney (bounded by the waters of Darling Harbour on the west, the northern boundary of the former AGL site on the north, Kent Street on the east and Margaret Street on the south), together with a small area to the south-west of the west end of Margaret Street. Like much of Darling Harbour this is an area of extensive reclamation, a process that began within a few decades of British settlement. The main recognisable elements of the original Sydney Section 67 have been obliterated by 20th century wharf developments in Darling Harbour.

2.1 Early occupation 1788-1830s

The configuration of the original shoreline is shown in a number of charts, hydrographic surveys and early maps, including Captain John Hunter's 1788 'Chart of Port Jackson New South Wales', Grimes c1800, James Meehan's plan of the town of Sydney of 1807 and an 1822 plan, probably by J S Roe (Fig. 2.2).[4] By the mid-1830s, when the first parish maps were being prepared, parts of the shoreline had already been modified for wharfage.

The first British settlement in 1788 centred around Sydney Cove and along the Tank Stream, but within a few years occupation had begun on the western ridge overlooking Darling Harbour. The 1792 'Survey of the Settlement in New South Wales New Holland', on which Governor Phillip marked the extent of the settlement, shows four clearly delineated areas to the west of what would later become the main military barracks (Fig. 2.1). Identified as the officers' quarters and the magazine, two of these areas were in close proximity to the shoreline of the, as then un-named, cove to the west of Sydney Cove, first known as Cockle Bay and later as Darling Harbour. By 1802 a track had been established along the western ridge, serving allotments and premises further to the south on the shore of Cockle Bay, indicating that there was already interest in these waterfront sites (Fig 2.3).[5]

The earliest buildings that can, with some confidence, be identified as located within what later became Sydney Section 67 are shown in Meehan's 1807 plan (Fig. 2.4). These comprise the western of two long thin rows of buildings to the west of lot 89 and southwest of the government windmill. These buildings were in a line with the continuation of Soldiers' Back Row, (renamed Kent Street in 1810), and it seems likely that these are the allotments and houses, readily identifiable by their orientation at an angle to the continuation of Kent Street, shown in later plans and surveys.[6] Few of the early maps give a true impression of the topography of Sydney Harbour and it is only the location and orientation of the earliest buildings that help to identify the realities of the shoreline contours.

[4] 'Chart of Port Jackson New South Wales Survey'd by Capt Iohn [sic] Hunter Second Captain of His Majesties Ship the Sirius 1788. Drawn from the original by George Raper Midn', Mitchell Library ZM2 811.15/1788/1, reproduced in *Eora Mapping Aboriginal Sydney 1770-1850*, State Library of New South Wales, 2006 and Max Kelly & Ruth Croker: *Sydney Takes Shape. A collection of contemporary maps from Foundation to Federation,* Doak Press, 1978, pp 12 & 14

[5] Max Kelly & Ruth Croker: *Sydney Takes Shape. A collection of contemporary maps from Foundation to Federation*, Doak Press, 1978, pp 8 & 10

[6] *Sydney Gazette* 6 October 1810, p 1; Harper's survey of Sydney SZ 434 and Parish of St Philip AO Maps 286 & 6219 (State Records NSW)

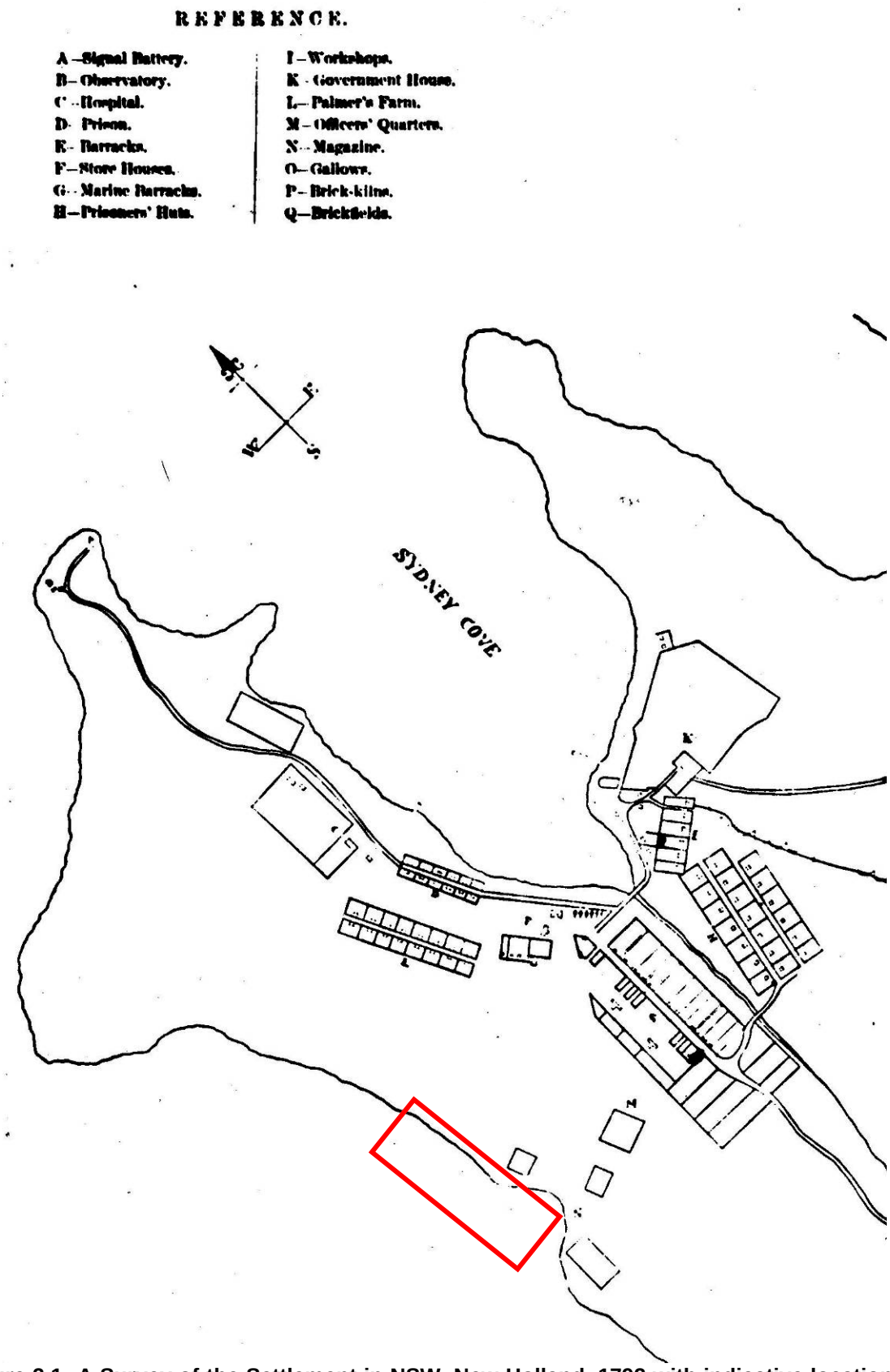


Figure 2.1: A Survey of the Settlement in NSW, New Holland, 1792 with indicative location for Barangaroo Stage 1. While there are some indicative structures nearby such as powder magazines these are oddly located. This map indicates there was some limited use of this area by the soldiers from the barracks on the higher ground. Max Kelly & Ruth Croker: *Sydney Takes Shape. A collection of contemporary maps from Foundation to Federation,* p8.

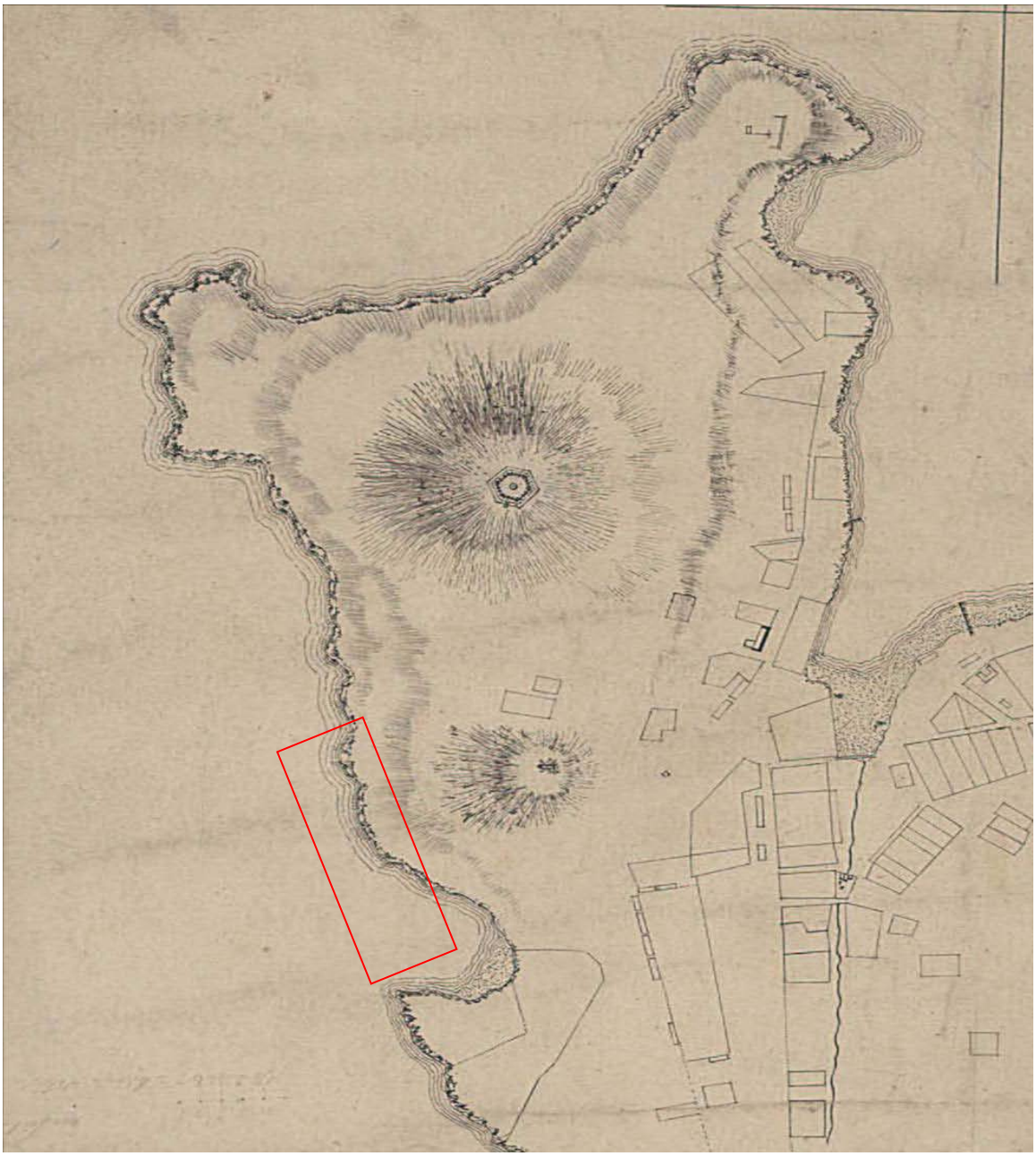


Figure 2.2: Plan of eastern side of Darling Harbour, c1800 by Surveyor Grimes. This shows the rocky foreshore and the approximate location of the study area with the focus of development around Sydney Cove and the rocky nature of the foreshore but with a narrow sandy beach. CO 700/NSW/18, UK National Archives.

Lesueur and Meehan's plans of Sydney drawn in 1802 and 1807 respectively show little occupation along the east side of Cockle Bay, and there are, similarly, few references to the place in the earliest editions of the *Sydney Gazette*. Amongst brief mentions of a cottage or two with well stocked gardens, the concealment of stolen goods, other felonious dealings and a shark attack, perhaps the most important was the announcement in January 1809 of the construction in Cockle Bay of a vessel of 60 tons for James and William Jenkins, the aptly named *Brothers*, an indication of the potential importance of the area in Sydney's maritime trade.[7]

[7] *Sydney Gazette* 1 January 1809 p 1 b-c and other references to Cockle Bay in issues of the *Gazette* from 1803-1809

Figure 2.3: Lesueur's 'Plan of the Town of Sydney', 1802. By this time there were some early grants for small farms, mostly for soldiers in the vicinity of the study area. There are access road somewhere near the modern alignment of Margaret Street and Sussex Street. Max Kelly & Ruth Croker: *Sydney Takes Shape. A collection of contemporary maps from Foundation to Federation,* p10.

Figure 2.4: James Meehan's 1807 'Plan of the Town of Sydney in NSW'. Max Kelly & Ruth Croker: *Sydney Takes Shape. A collection of contemporary maps from Foundation to Federation,* p10.

Governor Macquarie's wide-ranging orders of October 1810 concerning the 'Ornament and Regularity of the Town of Sydney' confirmed the inclusion of Cockle Bay as part of the maritime and mercantile life of the town: a wharf would immediately be built in Cockle Bay to receive produce from outlying settlements and to service the new Market-square on George Street.[8] This wharf was located near Market Street.

The first detailed evidence for occupation along the shores of Cockle Bay is provided by Harper's c.1823 survey of Sydney and, more specifically for the area west of Kent Street and north of Erskine Street, a sketch in the Surveyor General's sketch books of approximately the same date (Fig. 2.5). These two plans show the same details with the

[8] *Sydney Gazette* 6 October 1810 p 1c

sketch book plan providing greater clarity for that part of the Harper survey that is damaged by staining.[9] The pattern of allotments of the early 1820s is repeated on the earliest parish maps that were produced in the mid-1830s.[10]

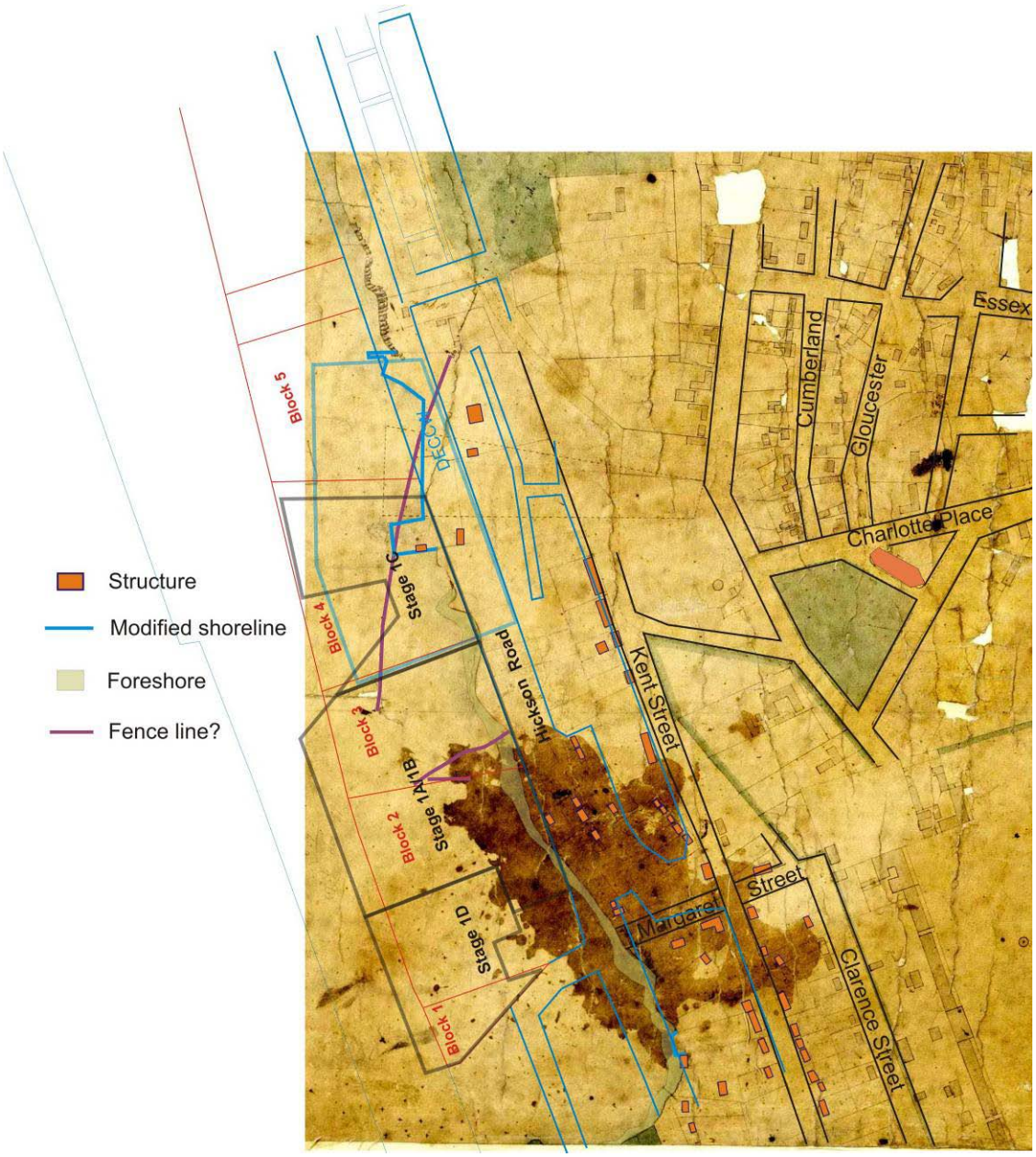


Figure 2.5: Harper's 1823 plan showing the approximate position of Barangaroo Stage 1 and the development blocks. The foreshore has been highlighted in green, this would be above the high tide line. There is thought to be evidence of fence lines indicating that these were probably part of early leases or grants. The squarish modified section of shoreline, highlighted, is part of Portions 16 and 15 which became the site of the gasworks. State Records. Abi Cryerhall, Casey & Lowe. Development blocks (red) basement (grey) DECCW declared area (aqua).

[9] Harper's Survey of Sydney c. 1823 SZ 434 and Surveyor General's Sketch Books Vol. 1 Fol. 82, Reel 2778 (SRNSW)

[10] Land & Property Management Authority, Parish Maps on-line, Parish of St Philip Reference nos. 14073701 and 14061501 (LPMA website)

Within the area west of Kent Street North, bounded by Macarthur's grant on the north (later the gasworks site) and the line of Margaret Street on the south, occupation was concentrated largely in the southern half where the alignment of the allotments and buildings suggest a close relationship with the site topography. For those owners with allotments and buildings close to the shoreline, some association with maritime activities or the production and conveyance of goods seems a possibility. Further to the north a row of three buildings are aligned with the new Kent Street North frontage. Modification of the shoreline, presumably with wharf construction, is evident on Macarthur's grant and immediately adjacent, on either side.

Figure 2.6: Approximate location of the study area development blocks and basement stages and the DECCW declared area. This sketch shows the same buildings and portions as on the 1823 plan (Fig. 2.5). Overlay is indicative use only. Surveyor General's Sketch Books Vol. 1 Fol. 82, Reel 2778 [nd but early 1820s], SRNSW. Development blocks (red) basement (purple) DECCW declared area (aqua).

By the early 1830s formal ownership of town allotments was being determined by the Court of Claims. Robert Russell's plan of Sydney Section 67 dated November 1834 identifies the boundaries of the allotments in this area, and the ownership of these grants as decided (where required) by the Court (Fig. 2.7).[11] The section plan also shows the buildings on the allotments, some of which can be identified on the earlier 1820s plans.

By 1834 the Kent Street North frontage of Section 67 was fully occupied and divided into comparatively small allotments. To the west, behind the Kent Street frontage, and with access to the Cockle Bay shoreline (now officially renamed Darling Harbour), the allotments were considerably larger.

To the south of Macarthur's grant these lots were granted in the 1830s as follows, from north to south, to Margaret Place:

- Lot 11 Richard Aspinall, Warham Jennett Browne and Edward Aspinall (Aspinall Browne & Co.) – granted 1835[12]
- Lot 17 Henry Thomson Bass – granted 1837[13]
- Lot 18 Samuel Thompson and his wife Elizabeth – granted 1834[14]
- Lot 19 Edward Boulger – granted 1835[15]
- Lot 5 William Macquarie Molle & others
- Lot 20 Francis Girard

Where the shoreline was unaltered, the High Water Mark formed the western boundary of these grants.

Documentary and oral evidence supplied to the Commissioners of Claims at their hearings provided evidence about the ownership of these allotments in earlier years.

- Edward Boulger's grant (Lot 19) had a chain of title from at least 1810 although there is no evidence from the 1823 survey of any occupation on the site. By 1830 there was a building by the northern boundary of the grant and this might account for the purchase price of £190 when Boulger bought it that year.[16]
- Samuel and Elizabeth Thompson's grant (Lot 18) had also had a succession of owners since it was acquired on lease in 1824 by Stephen Milton. The Thompson's had attempted to erect a wooden building on the land in 1833, but group of men, acting for Messrs Cooper and Levy who claimed ownership, tore the building down resulting in a case in the Supreme Court.[17] No buildings are shown in the 1834 Russell plan on what became the Thompsons' grant or on the land granted to Aspinall Browne & Co. (Lot 11).[18]

By 1834 two allotments were notable for the number and size of their buildings and for evidence of wharf construction and hence reclamation; these were Henry Bass' property and that belonging to Francis Girard, at the corner of Margaret Place (later Margaret Street).

[11] Sydney Section 67, Crown Plan S.45.684 by R Russell dated 18 November 1834, AO Map 5421 (SRNSW)
[12] Ser. 39 p 29 dated 5 July 1835 1a 0r 27p (LPMA)
[13] Ser. 47 p 232 dated 17 November 1837 3r 21p (LPMA)
[14] Ser. 29 p 165 dated 16 August 1834 2r 0p (LPMA)
[15] Ser. 39 p 77 dated 8 August 1835 1r 16p (LPMA)
[16] Edward Boulger, Court of Claims Memorial 523, NRS 913, 2/1790, Reel 1205 (SRNSW). The building is shown on Surveyor General sketch books Vol. 1 Fol. 18, Reel 2778 with correspondence references dated 1830 (SRNSW)
[17] S & E Thompson, Court of Claims Memorial 3, NRS 913, 2/1777, Reel 1234 and Surveyor General's Sketch Books Vol. 1 Fols. 18 & 19, Reel 2778 (SRNSW)
[18] Sydney Section 67, Crown Plan S.45.684 by R Russell dated 18 November 1834, AO Map 5421 (SRNSW)

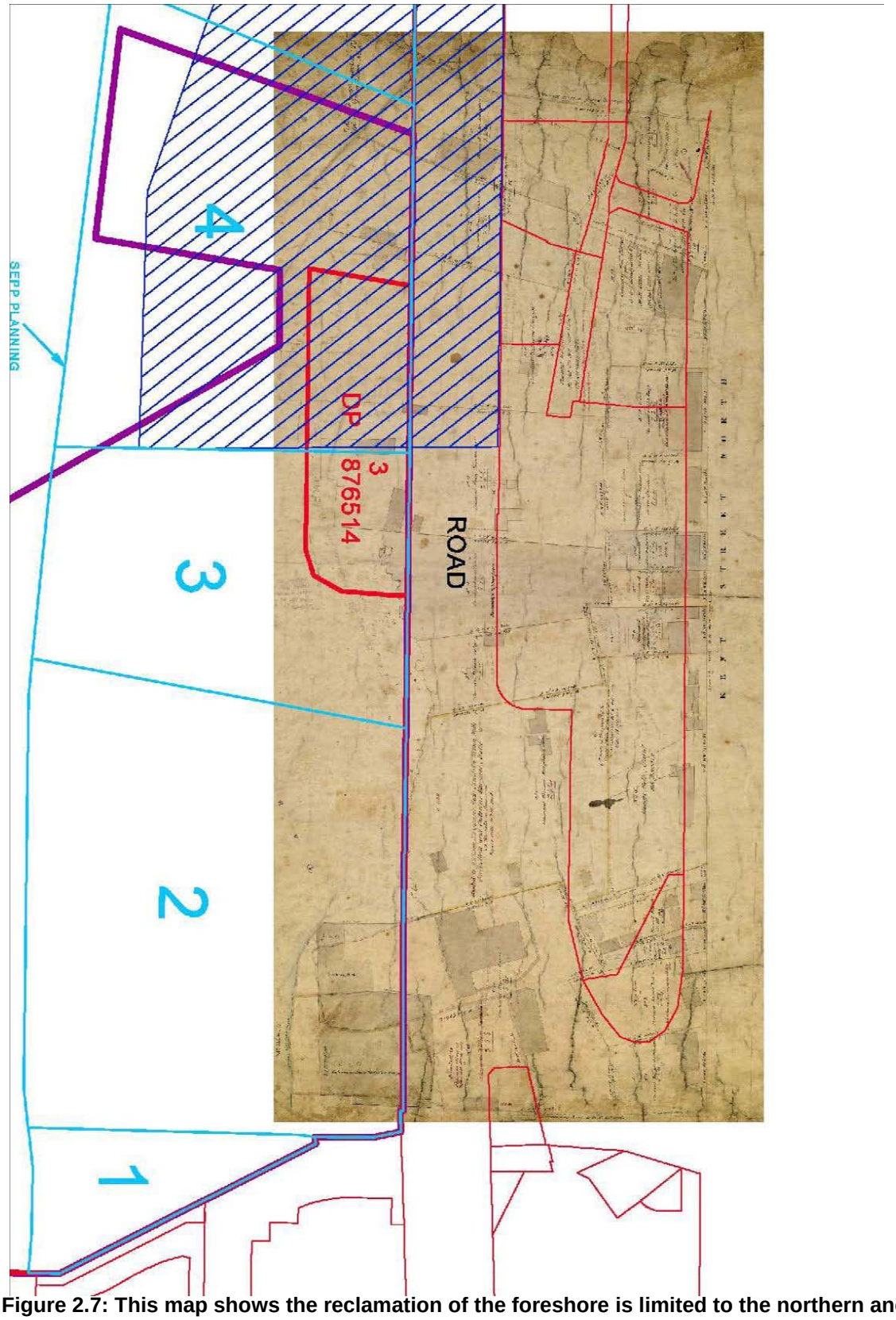


Figure 2.7: This map shows the reclamation of the foreshore is limited to the northern and southern sections while the middle area remains unchanged. Sydney Section 67 (Crown Plan S.45.684) by Robert Russell dated 18 November 1834, AO Map 5421, SRNSW. Rygate & Co surveyors Development blocks (aqua) basement (purple) DECCW declared area (blue hatched).

From the mid-1830s, with the ownership of the waterfront lots finally determined, Henry Bass and Francis Girard began to consolidate their interests in Darling Harbour.

2.2 Henry Bass, shipbuilder 1830s-1853 – Lots 17 and 18

Evidence for the history of the two lots purchased by Henry Bass in 1832 for £350 dated from 1819. A building (Lot 17) is shown towards the southern boundary of the area in an 1830 sketch and a rapid increase in value between 1831 and 1832 suggests that some of the other improvements shown on the 1834 plan could have been made at this date.[19] This coincided with Bass' appearance as a 'shipbuilder Darling Harbour' in the *NSW Calendar and Post Office Directory for 1833* a publication in which he had a full page advertisement, complete with illustration, two years later (Fig. 2.8). The wharfage on the shoreline of his grant and the large buildings were presumably his ship building enterprise where 'Every description of Vessels under 500 Tons register built by the most approved Models & repaired – Boats, Spars &c'.[20]

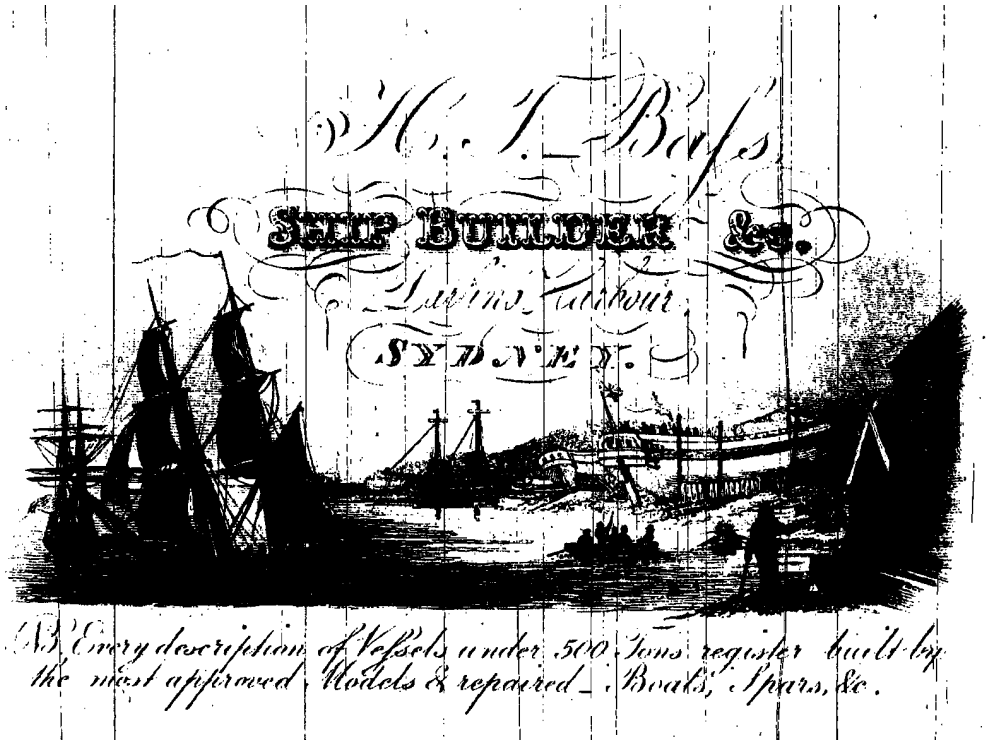


Figure 2.8: Sketch of Mr Bass' ship yard in 1835. NSW Calender & Post Office Directory 1835, opp. Page 8.

Henry Bass acquired Samuel and Elizabeth Thompson's grant (Lot 18) in 1836; Lot 9 on the Kent Street North frontage that gave him access to the street in 1837 and in 1845 also purchased a small part of Lot 11 adjoining the northwest corner of his property on the

[19] H T Bass, Court of Claims Memorial 352, NRS 913, Reel 1203 (SRNSW) and PA 569 (LPMA) and The building is shown on Surveyor General sketch books Vol. 1 Fol. 18, Reel 2778 with correspondence references dated 1830 (SRNSW)

[20] NSW Calendar & Post Office Directory 1835, Alphabetical section opposite p 8

boundary of the Gas Company's site, giving him more water frontage.[21] In combination with his original grant, these became his waterside premises.[22]

From the 1830s to the 1850s reclamation within Bass' land consisted of wharfage parallel with the original shoreline and what may have been in effect a small dock, or shallow inlet.[23] In addition to the wharf, the premises included a workshop and two houses.[24] By 1850 Bass had also built a row of very small houses off Kent Street North on the east side of his property, known as Bass' Buildings; no doubt a lucrative source of income. Wells' map of the City of Sydney in 1850 shows the property and buildings.[25] By comparison with his neighbours the rateable valuation of Bass' property was quite low, suggesting that his waterside premises were perhaps not very sophisticated or up to date.[26] By at least the early 1850s the premises were leased out by Bass who was presumably no longer an active shipbuilder.[27]

In 1853 Bass sold his land to John Reeve and in 1854 it was purchased by merchants Charles Smith and John Henry Challis. A year later Smith and Challis also purchased Edward Boulger's Lot 19, immediately to the south, which appears to have remained undeveloped since the 1830s, and with this extension to Bass' original holdings began to redevelop the property.[28]

2.3 Smith & Challis and the Grafton Wharf 1854-1880

Scottish born Charles Smith had been in the merchant navy serving in the Baltic and West Indies before turning to whaling after his arrival in New South Wales in 1836 and eventually settled down to life as a shipping merchant after his final voyage in 1852. Smith's appointment as manager of Flower, Salting & Cos' whaling fleet in 1850 would have brought him into contact with J H Challis, a partner in the firm, who acquired considerable wealth in real estate, wharves and pastoral properties.[29] Given Challis' much higher social profile, it was his name that appeared on maps showing the Darling Harbour wharfage in the 1850s (Fig. 2.10).[30] Challis had however left the Colony in 1855, shortly after his joint acquisition of the land and returned to England to live and it was Captain Charles Smith who continued as the active partner in Sydney.

[21] PA 569 (LPMA)
[22] PA 569 (LPMA)
[23] This can be seen in the 1875 plan on which the shoreline as in Russell's 1834 survey is also shown, see C H Wansbrough, Darling Harbour Frontage Section No. 2, 1875, (Crown Plan P.26.574) AO Map 4775 (SRNSW)
[24] Rate Assessment Gipps Ward 1845 (City of Sydney Archives)
[25] W H Wells: 'Map of the City of Sydney 1850', Mitchell Library on-line
[26] The Hunter River Company's wharf and Breillat's wharf were assessed at £400 and £500 and Bass' wharf at £50, Rate Assessment Gipps Ward 1845 (City of Sydney Archives)
[27] Rate Assessment Gipps Ward 1851 (City of Sydney Archives) leased to Laurence Corcoran and Archibald Rodgers and also Surveyor General Sketch Books Vol. 7 Fol. 19 [nd] showing area leased to Coredran [sic]. Reel 2780 (SRNSW)
[28] PA 569 (LPMA)
[29] *Australian Dictionary of Biography Volume 6 1851-1890 R-Z,* Melbourne University Press, 1976, entry for Charles Smith pp 141-142 and *Volume 3 A-C*, 1969, entry for John Henry Challis pp 374-375
[30] For example Woolcott & Clarke's Map of the City of Sydney, 1854 and Smith & Gardiner's Map of Sydney and Suburbs 1855

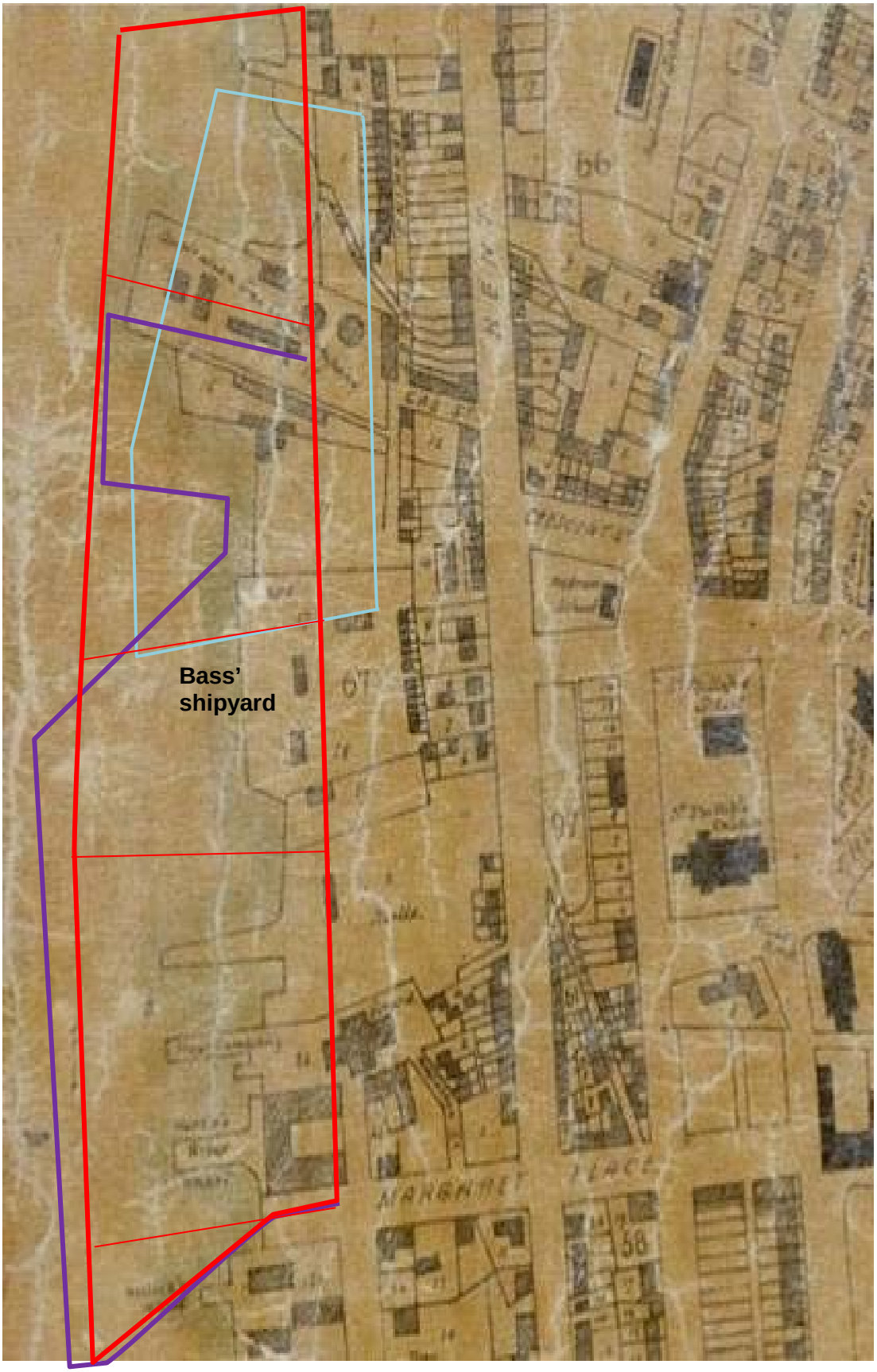


Figure 2.9: This 1850 plan is similar to the 1854 plan, Figure 2.10. Location of Barangaroo Stage 1 is approximate only. W H Wells: 'Map of the City of Sydney 1850', ML NSW. Development blocks (red) basement (purple) DECCW declared area (blue).

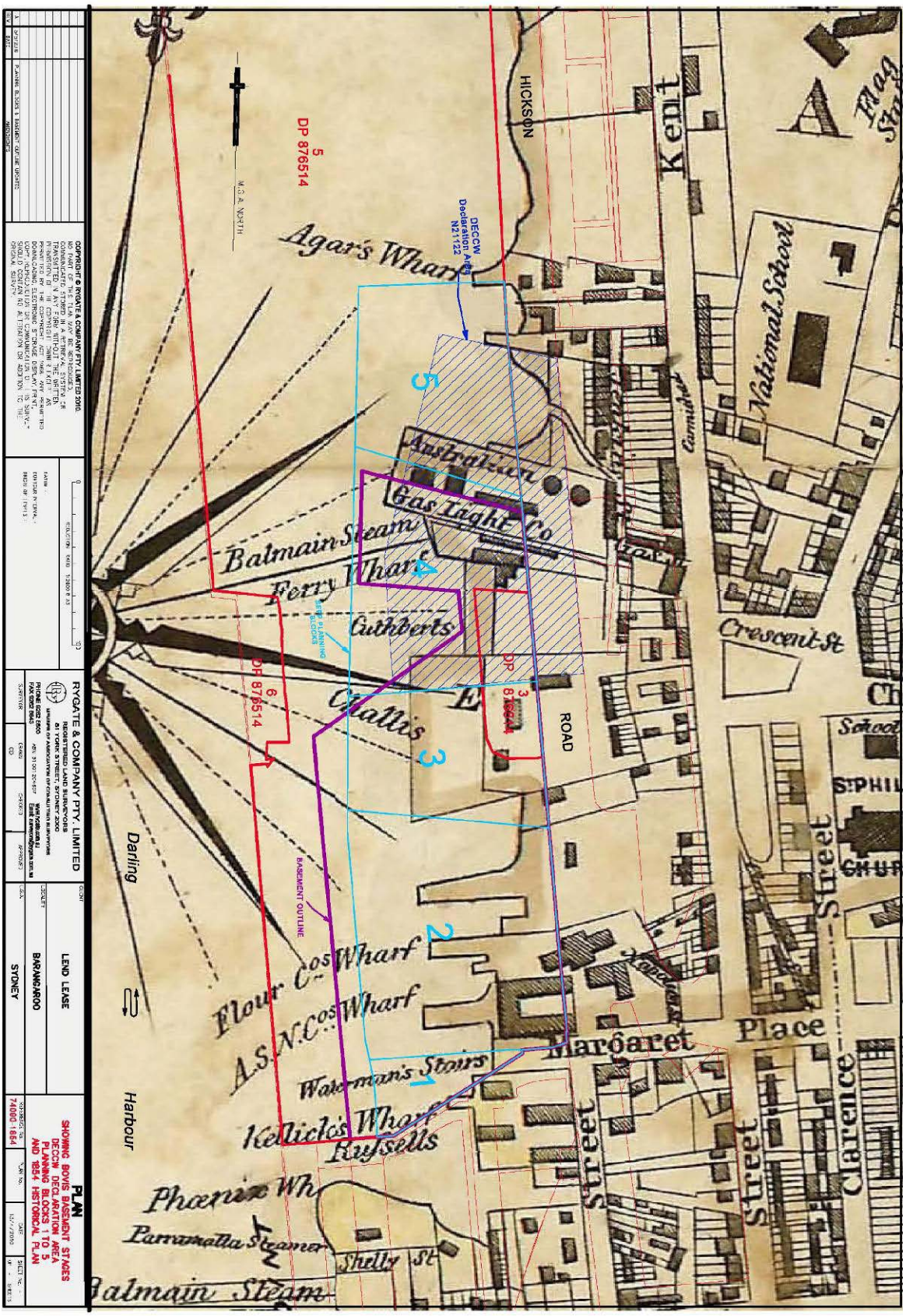


Figure 2.10: Woolcott & Clarke's Map of the City of Sydney, 1854, Historical Atlas of Sydney with overlay by Rygate & Co, surveyors. Development blocks (aqua) basement (purple) DECCW declared area (blue hatched).

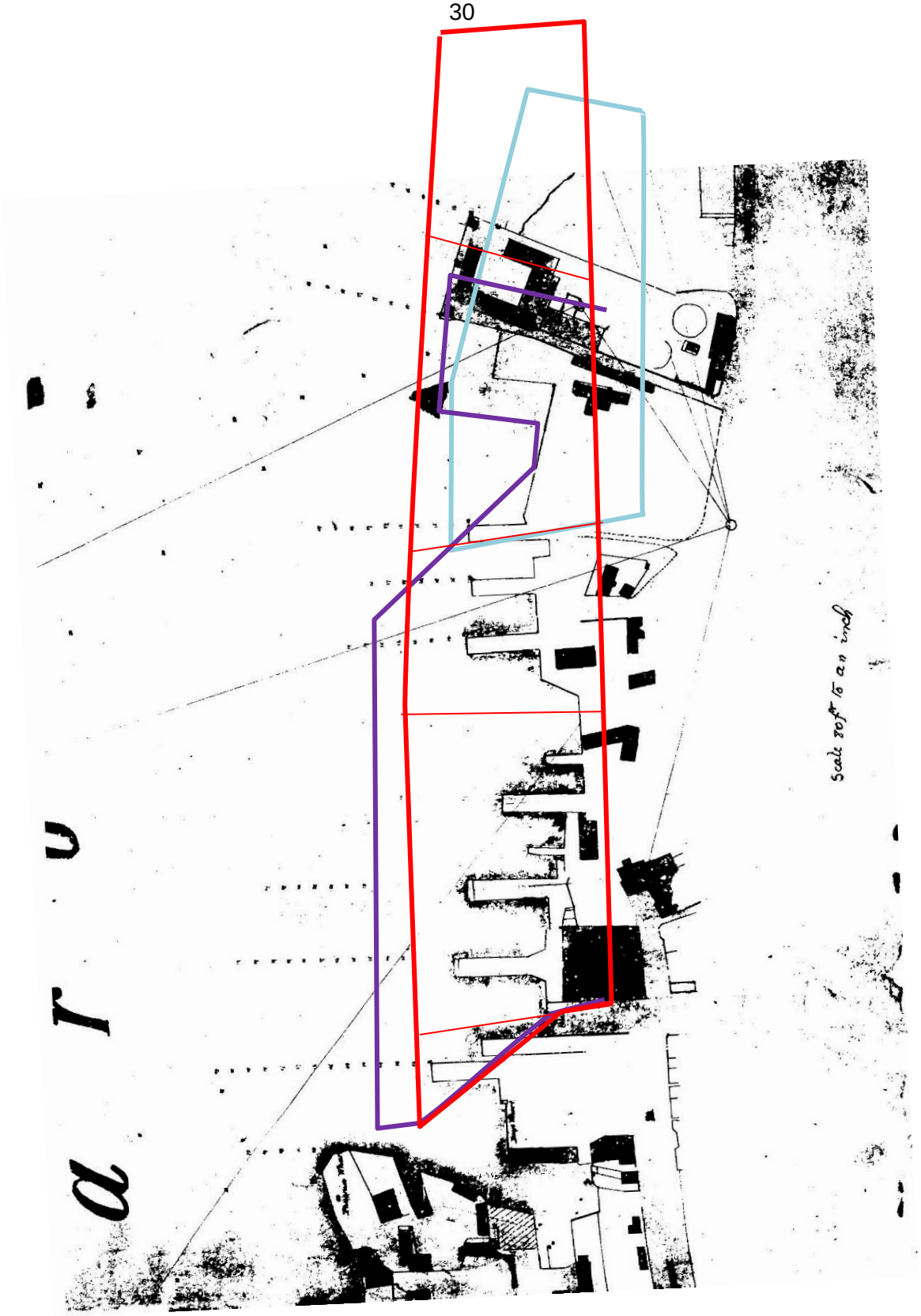
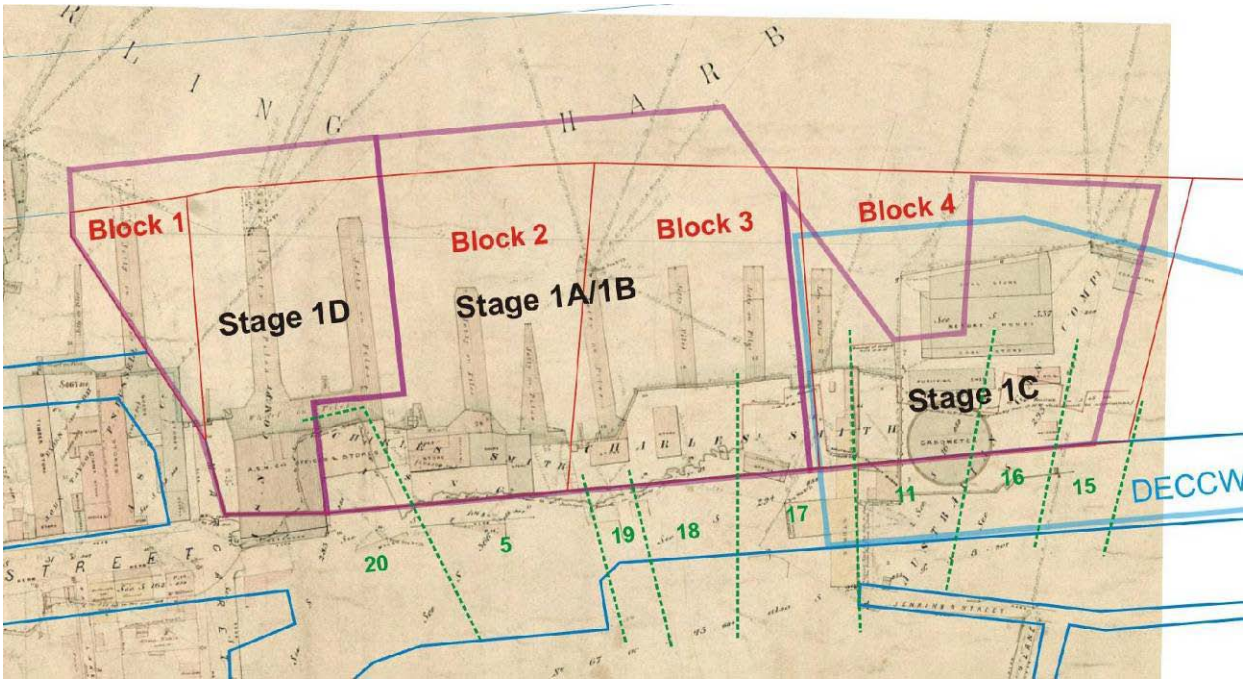


Figure 2.11: Substantial changes had been made to the wharfage by c1861, location of study area approximate. Key: purpleW G Bennett: Plan for office use of Darling Harbour taken from plan of Chief Engineer, September 1863 (Crown Plan D.2a.1628) AO Map 2633 (SRNSW) [Documentary evidence indicates that the original plan is earlier that 1863, the date when it was copied as it does not show a new jetty that was leased in 1861]. Development blocks (red) basement (purple) DECCW declared area (blue).

Archaeological Research Design & Management Strategy

Barangaroo Stage 1



Overlay of the study area onto the 1875 plan with early portions indicated in green

Report to

Lend Lease (Millers Point) Pty Ltd

May 2010

CASEY & LOWE Pty Ltd
Archaeology & Heritage

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Contents

Appendices

Document Status

Name	Date	Purpose	Author	Reviewer
Mary Casey	21/5/2010	Draft Submission	Mary Casey	Tony Lowe
Mary Casey	26/5/2010	Final	Mary Casey	Tony Lowe

ARCHAEOLOGICAL RESEARCH DESIGN & MANAGEMENT STRATEGY
BARANGAROO STAGE 1

1.0 Introduction

1.1 Background

This report is written as part of the Environmental Assessment for the Part 3A project application for Barangaroo Stage 1. It is also a requirement identified in the Statement of Commitments which are part of the concept plan approval for the site. The Minister for Planning has given approval to the Concept Plan for Barangaroo under Part 3A. Casey & Lowe have written a detailed Archaeological Assessment for this project which is also being submitted as part of the Environmental Assessment for this application, *Archaeological Assessment, Barangaroo Stage 1* (May 2010).

The development of Barangaroo is part owned and currently controlled by the Barangaroo Delivery Authority (BDA). Lend Lease Development is the selected development proponent for the redevelopment of Barangaroo Stage 1.

The project has been classified as a 'major project' to be determined under Part 3A of the EP&A Act. This research design and management strategy is intended to provide guidance and methodologies for undertaking the archaeological program within the approved development.

The archaeological works associated with the redevelopment of Barangaroo Stage 1 is proposed to be undertaken in stages:

1. Preliminary works involves the demolition of above ground structures and site establishment. Approval for these works has already been granted. Archaeological testing will be undertaken concurrently with these demolition works. The aim of the testing is to confirm the accuracy of the model of the site's archaeological potential and refine our management strategy for dealing with the most significant archaeological resource.
2. Archaeological salvage works are likely to commence once project approval has been given and prior to the start of works such as piling and remediation. It is currently expected that the archaeological program for Stage 1A/1B basement will be completed prior to bulk excavation commencing in February 2011.
3. Archaeological work for Stages 1C and 1D is likely to commence after the initial stages are completed but prior to piling and bulk excavation.

Lend Lease will submit separate Project Application covering Blocks 1 to 4 and this report aims to identify the archaeological resource within that part of the Barangaroo Stage 1 area and provide a management strategy for the archaeological resource.

1.2 Study Area

Barangaroo Stage 1 is located along the eastern side of the Darling Harbour precinct with Hickson Road forming the eastern side of the study area and Shelly Street the southern end. The western side is within the existing concrete wharfage and the northern end is also within the wharfage. Blocks 1 to 4 form the basis of the Stage 1 development (Figs 1.1, 1.2, 1.3). There is an area of contamination associated with the operation of the historic gasworks (c1840-1910s) that was located within the northern part of the site (Blocks 4 and 5). The Stage 1 redevelopment will provide for commercial, residential, tourist, retail and

community space as well as 3ha for public recreation. Stage 1 also includes basement carparking and an enlarged southern cove.

The existing site consists of the 1960s concrete wharfage along Hickson Road. This has recently been used for container wharfage, the World Youth Day and for docking of cruise ships.

Figure 1.1: Barangaroo Stage 1 within the current wharfage.

1.3 Aims of this Report

This report is written in response to the requirements of the Part 3A process and the commitments made as part of that process to write an Archaeological Assessment and Research Design. The Archaeological Assessment for Barangaroo Stage 1 was written in May 2010 and it is a companion document to this report.

This report provides:

- Clarification of the impacts on the archaeological resource, both existing and proposed.
- Management Policy based on Heritage Branch guidelines and best practice.
- A strategy for managing the archaeological resource in light of the proposed impacts and construction program.
- A research design outlining how the archaeological program will be managed.
- Research questions for exploring the archaeological resource and to be addressed in the excavation report.

This report conforms to the requirements of the various guidelines produced by the Heritage Council of NSW relating to the assessment and management of the archaeological resource.

For the detailed historical background please see the Archaeological Assessment.

The Aboriginal archaeology of the site has been assessed by Comber Consultants in consultation with the Metropolitan Local Aboriginal Land Council (MLALC). Comber Consultants are also writing a Research Design and Management Strategy for the site as required by the commitments under Part 3A.

1.4 Statutory Context and Constraints

The Minister for Planning has given Part 3A approval for a Concept Plan for the Barangaroo Stage 1 redevelopment. Lend Lease will be lodging a series of Project Applications (PA) for various elements of the project. This report is relevant to the archaeological issues of all PAs that require a Research Design. It is noted that the archaeological resource is principally impacted by the Bulk Excavation and Basement Carparking works with some minor impacts from the excavation for the 'southern cove'.

1.4.1 Part 3A, Environmental Planning and Assessment Act, 1979

Where the proponent has decided to apply for development consent under Part 3A of the *Environmental Planning and Assessment Act* (EP&A) they may be subject to different approval processes to developments covered by Part 3 (or other Parts) of the Act. In particular, the Minister for Planning may become the consent authority for certain applications. This report forms part of the documentation necessary for a Part 3A application.

What does Part 3A do?[1]

Part 3A consolidates the assessment and approval regime for all major projects previously addressed under Part 4 (Development Assessment) or Part 5 (Environmental Assessment) of the Act. Part 3A applies to major State government infrastructure projects, development previously classified as State significant, and other projects, plans or programs of works declared by the Minister. The amendments provide a streamlined assessment and approvals regime for major infrastructure and other projects of State or regional significance. They also improve the mechanisms available under the EP&A Act to enforce compliance with approval conditions or the Act. The new provisions will continue to ensure the appropriate level of community consultation and environmental assessment is undertaken, based on the level of risk or community concern.

[1] DIPNR Circular: Commencement Part 3A (Major Projects) of the EP&A Act, PS05-006, issued 29 July 2005

The client will respond to the Director General's requirements with a set of commitments. The ones relating to Non-indigenous Archaeology will be based on the recommendations provided at the end of this report.

1.5 Limitations

Sufficient time and resources were provided to allow Casey & Lowe to write this report and address a range of issues. Considerable consultation was undertaken to clarify a range of issues and constraints associated with the site and its development and as a means of trying to clarify as many issues as possible. There are still likely to be limitations in our understanding of existing impacts which are extensive throughout the area.

1.6 Authorship

This report was written by Dr Mary Casey, Director, Casey & Lowe with contributions by Cos Coroneos, Comsos Archaeology and Abi Cryerhall, Casey & Lowe. It was reviewed by Tony Lowe, Director, Casey & Lowe.

1.7 Acknowledgements

Warwick Bowyer, Lend Lease
Paula Mottek, Lend Lease
Michelle Mason, Lend Lease
Mark Burns, Lend Lease
Abi Cryerhall, Casey & Lowe

1.8 List of Illustrations

2.0 Proposed Impacts on the Archaeological Resource

2.1 Identified Impacts on the Archaeological Resource

The main impacts on the identified potential archaeological resource in Barangaroo Stage 1 is from the Bulk Excavation and Basement Carparking (PA1) with some further impacts from the excavation for the 'southern cove' which cuts into Block 4 (Fig. 2.1).

2.2 Bulk Excavation and Basement Carparking (PA1)

The impacts from the bulk excavation and carparking include:

- Construction of a retention system around the perimeter of the basement to make it watertight and to retain the surrounding fill (Fig. 3.1).
- Bulk excavation of the approved basement footprint down into rock.

2.2.1 Impacts on the archaeological resource from the bulk excavation and basement carparking works

Perimeter Retention Systems

The nature of the existing geotechnical conditions on site will lead to the installation of extensive perimeter retention systems to the proposed basements. The exact nature of the proposed retention systems will be subject to detailed designs, however, a mix of the following three arrangements depending on the variable geotechnical conditions is expected.

- Diaphragm Walls up to 1m width and to a depth into rock
- Secant pile through bentonite slurry wall of typical width 600mm
- 600mm concrete wall constructed under bentonite slurry trench

Following detailed design discussions and the predicted wet nature of the site it has been identified that the hardstand concrete surface needs to be kept in place until after the perimeter retention system has been constructed. This is essential to retaining Hickson Road. Therefore no archaeological work will be undertaken within the footprint of the perimeter retention system. This is a fairly typical practice due to the need to pile through relatively undisturbed soil. Such practices were used at Darling Walk, Darling Harbour and the Cross City Tunnel. In addition the presence of the retention system allows for excavation down to natural soil strata of -0.8 which we have found was the typical level excavated down to natural at Darling Walk, Darling Harbour.

Bulk Excavation

This will remove all the archaeological resource within the footprint of the approved basement within Blocks 1, 2,3 and 4. As identified in the archaeological assessment, the main archaeological resource to be subject to archaeological excavation is within the eastern 70m of the site. The assessment also identifies the nature, extent and significance of the archaeological resource within the eastern part of Blocks 2, 3 and 4.

2.3 Southern cove excavation

The excavation for the cove is exterior to the basement and perimeter retention system in Block 4. This will involve the bulk excavation of this part of the existing wharf to allow for boats to dock within the cove. Most of this area was excavated in the 1920s for the new jetties installed within the footprint for the gasworks site (Fig. *). This work removed the archaeological resource in the northern area while to the south there is some potential for remains of jetties.

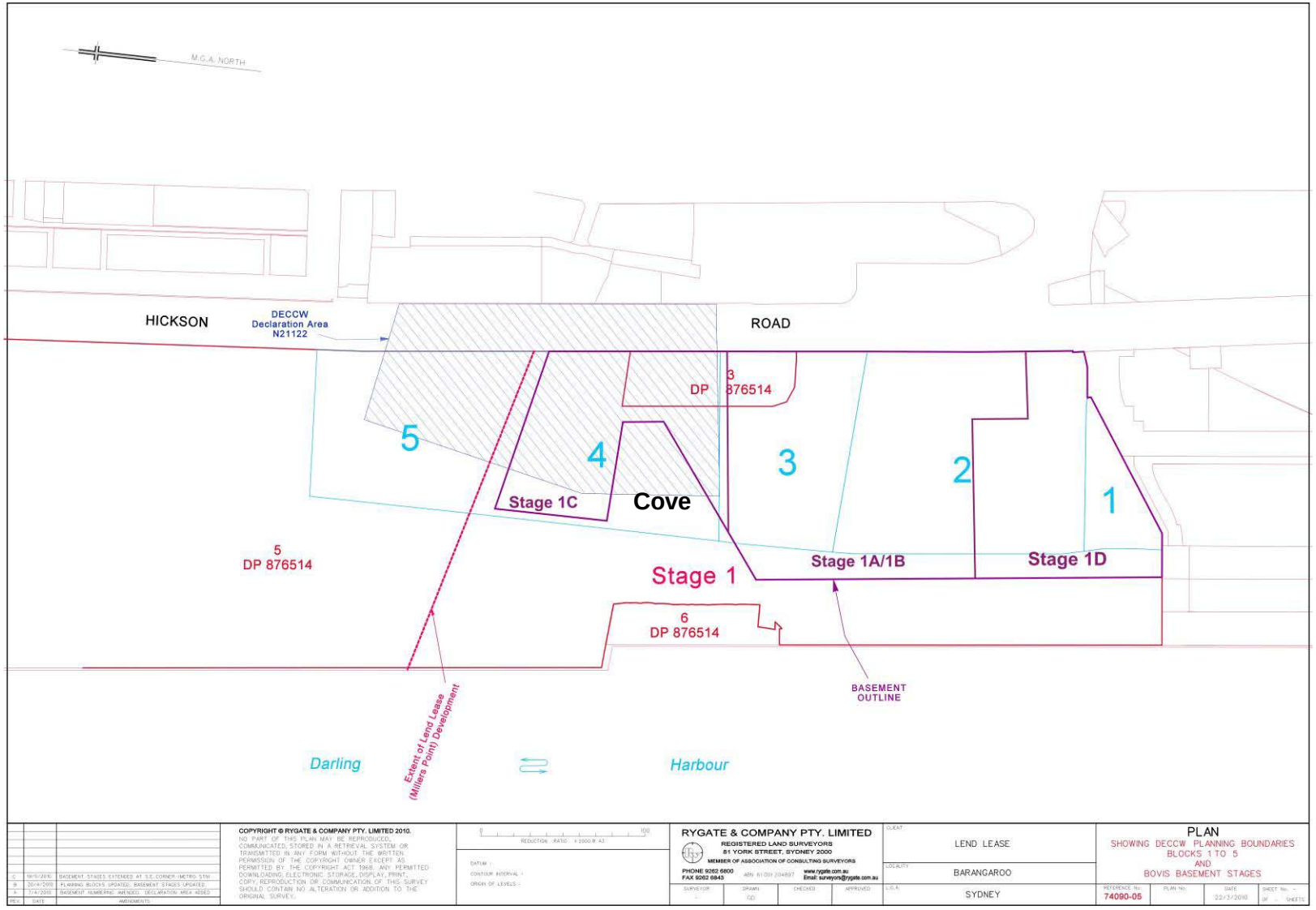

Figure 2.1: Plan showing the five development blocks, basement excavations, location of the cove which is mostly within Block 4, and the main areas of contamination (blue hatched lines). Purple line indicates the basement footprint with various stages labelled. The blue lines indicated the development blocks and the DECCW area is hatched. Rygate & Co for Lend Lease Millers Point.

3.0 Review of Basement Impacts on the Potential Archaeological Resource

3.1 Archaeological Potential

The archaeological potential of Barangaroo Stage 1 is outlined in detail in Section 3 of the Archaeological Assessment. Extracts from the assessment are included below to assist discussion of impacts from proposed works.

3.1.1 Basement Stage 1A/1B

3.1.1.1 Block 2: Impacts on Potential Archaeological Resource

The occupation within this area typically related to early maritime trade and other similar activities. The area was generally been built up with stages of reclamation, construction of seawalls and infilling. The mid 20th-century construction works will have had some impacts on areas but these will generally be isolated and relate to caissons and deeper services. The following levels, based on Darling Walk excavation program, can be used as guides for the levels at which some of the archaeological resources will be found:

- Water table was encountered at between -0.3m and 0.2m and higher after rain.
- Foreshore span with archaeological features ranged from -0.8m to 0.8m where sands met rocky outcrops (information based on Area 7 and Area 6 combined).
- Mid 19th-century level after reclamation across all areas varied between 1.5m to 1.7m (in Barkers Mill yard).

Remnant timber piling and cultural deposits are likely to be present within marine sediments under the shadow of Jetties 10, 11, 12. Some timber piling and cultural deposits within the marine silt could be present eastwards of the early 20th-century seawall, and buried under 19th-century reclamation.

It is likely that most of the area in the west has been considerably impacted by dredging in the 1950s and 1960s but there is some limited opportunity for archaeological evidence in this area. The archaeology along the east should be relatively intact and contain evidence of all the identified phases of occupation.

3.1.1.2 Block 3: Impacts on Potential Archaeological Resource

The occupation within this area typically related to early maritime trade and other similar activities. The area was generally been built up with stages of reclamation, construction of seawalls and infilling. The mid 20th-century construction works will have had some impacts on areas but these will generally be isolated and relate to caissons and deeper services. Some timber piling and cultural deposits within the marine silt could be present eastwards of the early 20th-century seawall, under 19th-century reclamation.

The following levels based on Darling Walk excavation program can be used as guides for the levels at which some of the archaeological resources will be found:

- Water table was encountered at between -0.3m and 0.2m and higher after rain.
- Foreshore span with archaeological features ranged from -0.8m to 0.8m where sands met rocky outcrops (information based on Area 7 and Area 6 combined).
- Mid 19th-century level after reclamation across all areas varied between 1.5m to 1.7m (in Barkers Mill yard).

It is likely that most of the area in the west has been considerably impacted by dredging and that there is little opportunity for archaeological evidence in this area. The archaeology along the east should be relatively intact and contain evidence of all the identified phases of occupation.

3.1.2 Basement Stage 1C

3.1.2.1 Block 4: Impacts on Potential Archaeological Resource

The 1788-1839 occupation within this area typically related to early maritime trade and infrastructure and other similar activities. The area was generally been built up with stages of reclamation, construction of seawalls and infilling. The occupation from 1839 by the AGL gasworks involved phases of expansion, reclamation and upgrading of technology. Block 4 includes part of the footprint of the original gasworks as well as the 1860s extension to the south (AA Fig. 3.1). The 1920s construction of two double-decker wharves, berths 5 and 6, required the excavation of part of the reclaimed land including wharf, coal stores and retort houses. Therefore the western section of the gasworks was removed at this time. The mid 20th-century construction works will have had some impacts on areas but these will generally be isolated and relate to caissons and deeper services. Remnant timber piling and cultural deposits formed within marine sediments under the shadow of Jetty 6. Some timber piling and cultural deposits within the marine silt could be present eastwards of the early 20th-century seawall, under 19th-century reclamation.

The following levels based on Darling Walk excavation program can be used as guides for the levels at which some of the archaeological resources will be found:

- Water table was encountered at between -0.3m and 0.2m and higher after rain.
- Foreshore span with archaeological features ranged from -0.8m to 0.8m where sands met rocky outcrops (information based on Darling Walk, Area 7 and Area 6 combined).
- Mid 19th-century level after reclamation across all areas varied between 1.5m to 1.7m (in Darling Walk, Barkers Mill yard).

It is likely that most of the area in the west has been considerably impacted by 1950s and 1960s excavation and dredging but there is still some likelihood for piles and some cultural deposits with the shadow of Jetty 6. There is limited opportunity for archaeological evidence in this area. The eastern area is likely to contain substantial remains of Australia's first gasworks but this is part of an extensively contaminated area (see Assessment Section 3.7 and Appendix 1 this report). The ability to undertake archaeological works in this area is likely to be highly compromised.

3.1.3 Basement Stage 1D

Block 1

This area is within the original harbour but it should include archaeological remains associated with changing wharfage during the 19th and 20th centuries. There is no foreshore or reclaimed land within this development block though there may be remnant timber piling and cultural deposits formed within marine sediments under the shadow of Jetty 12.

Block 2

This part of the study area, depending upon the accuracy of overlays, probably includes the northern portion of the early reclaimed land in Portion 20 and then various 19th and 20th-century wharfage as well as Portion 5. See discussion of Block 2 in Basement 1A/1B above.

3.1.4 Southern Cove

At one time the eastern footprint of the cove would have been within the AGL gasworks site but because the 1920s redevelopment of the gasworks required bulk excavation into western part of the gasworks, most of the gasworks within the cove is considered to have been removed. There may be some remains of the northern jetty within this area.

4.0 Archaeological Management Policy

4.1 Preamble

The surviving archaeological resource within the study area has both Local and State significance. Some of these remains have been highly impacted while other areas are considered to have a moderate to high level of archaeological potential.

4.1.1 Reasons for Excavation

- The relics' provisions of the *Heritage Act* 1977 require the recording of archaeological relics that are to be disturbed by a development. While Part 3A suspends the relics provisions of the Heritage Act 1977, there is still a requirement to record the remains according to best practice guidelines and standards.
- An archaeological excavation is only recommended following a full archaeological assessment of a site.
- The site should have a medium to high level of significance to warrant archaeological excavation.
- Generally, archaeological remains will only be excavated if they are to be impacted by or destroyed by a new development.
- The archaeological investigation of the remains must be able to answer current research questions in archaeology and history and other areas of substantive research.
- To add to knowledge about Australian history through excavation of the site in a deductive scientific manner.

4.1.2 Aims of an Archaeological Investigation Program

- To undertake detailed recording of the archaeological remains before they are destroyed by a development.
- To produce a detailed recording of the archaeological remains and write an excavation report which includes a description of the results of the excavation, analysis of the material and answers to the research questions.
- The type of relics or archaeological deposits that may be excavated include sub-surface structural remains, remains of jetties and wharfs, reclamation layers, wells, cesspits, rubbish pits and deposits, post holes, artefact scatters and other archaeological deposits.
- Best practice archaeological excavation and recording has to be undertaken in a structured manner using appropriate methodology which is set out in Section 7.
- Dissemination of the results of the archaeological investigation program to peers and the public through a series of strategies.

4.1.3 Policy Documents and Guidelines

The following policy guidelines were produced by the Heritage Branch, Department of Planning and are essential guidelines for managing the archaeological resource.

- Excavation Permit approval to carry out historical archaeological investigations, including Conditions of Approval under the relics provisions of the *Heritage Act* 1977. Please note this is not relevant for Part 3A approvals.
- *Procedures for the Evaluation of Excavation Permit Applications* under the *Heritage Act*.
- *Archaeological Assessment Guidelines* 1996.
- *Historical Archaeological Excavations: Code of Practice*, 1993.
- *Historical Archaeological Sites: Investigation and Conservation Guidelines*, 1993.
- *How to prepare archival records of heritage items*, 2nd edition, 1995.
- *Photographic recording of heritage items using film and digital capture*, 2006.

- *NSW Heritage Manual*, 1996, 2001. This manual includes guidelines for performing various stages of the heritage process particularly those relating to assessment and management of Heritage Significance.
- The *Burra Charter* of Australia ICOMOS.

4.2 Management Policy

Archaeological Investigation

1. Where there is to be an impact on the archaeological resource this must be managed according to the Best Practice archaeological excavation and recording methods outlined in Section 7.
2. Where impacts on the archaeological resource can be avoided then certain areas should be able to be protected into the future.
3. Where it is possible to retain State significant archaeology it should be retained *in situ* but not at the expense of diminishing the significance of the resource through an accumulating number of penetrations and piecemeal destruction of the resource.
4. Where the archaeologists consider that proposed impacts on the resource, taking into account existing impacts and within a holistic understanding of all proposed impacts, have reached a threshold which will affect the significance of the resource and the ability to archaeologically read the site in the future, then it should be subject to detailed archaeological investigation (Section 7.5).
5. The archaeological program for historic-period remains needs to work in closely with the program for Aboriginal archaeology and their needs for testing and monitoring of impacts.
6. Both programs require sufficient time and funding to investigate and record the archaeological remains.
7. The developer needs to endorse this approach and provide sufficient time in their program and funding to undertake the archaeological investigation program.

Post-Excavation and Reporting Program

Once the archaeological program is completed there are likely to be hundreds of boxes of artefacts, numerous field plans to be turned into final plans and considerable description of the archaeological remains to be written up. It requires a systematic process to manage the output of such a large archaeological program. This program needs to be undertaken according to best practice methodologies and result in a substantive outcome in terms of analysis and interpretation of the archaeology within the identified research framework. Best practice methodologies requires:

1. Production of a detailed description of the results of the archaeological program for each area and the site as a whole. The outputs for this work include:
    - trench reports
    - detailed Harris matrix
    - final computer plans made from the field plans
    - synthesis of the results
    - collated GIS plans for the site
    - photo archive of all media used
2. Detailed artefact catalogue according to best practice methodologies and it must use minimum vessel/item counts. This work is to be undertaken by specialists. The artefacts must be catalogued according to location, context number, catalogue number, and stored in appropriately labelled archive boxes. Appropriate methodologies will need to be used for different classes of artefacts, such as animal bone, ceramics, and glass.
3. Detailed analysis of the results of the archaeological program, including artefact analysis.
4. Permanent storage will need to be provided for the artefacts at the end of the project. Sydney Harbour Foreshore Authority has a repository and it is possible the artefacts can be stored there. In addition a number of State government agencies have lodged artefacts with State Records.

5.0 Archaeological Management Strategy

5.1 Excavation Issues

Issues affecting the implementation of best practice archaeological standards are:

1. The presence of a DECCW declared area of contamination in the gasworks which will affect how the significance of this resource can be realised.
2. Additional contamination in northeast corner of Block 3.

5.2 Archaeological Testing

A program of archaeological testing will inform the Environmental Assessment. The reasons for undertaking testing relate to the clarification of a number of archaeological issues.

- Does the anticipated archaeological resource survive within key parts of the study area?
  - Notably Block 2: Portions 20 and 5; Block 3: Portion 17
  - Later surfaces and structural remains of 19th-century wharfage
- Are the assumptions underlying the assessment of archaeological potential and significance accurate?
  - Notably is there a limited archaeological resource beyond the 70m zone?
  - Do the mid to later 19th-century wharfage levels survive?
- What is the nature of the water and soil conditions across the site and how might this affect the archaeological and building programs? Currently anticipated that ground water will typically be encountered around 0.6m and that we will be able to undertake excavation in those areas prior to dewatering of the site but following construction of the perimeter retention system. We will only be able to excavate below 0.6m following dewatering.
- Test the evidence from the geotechnical bores to see if it accurately depicts the levels at which we are likely to encounter natural soil levels and the nature of fills across the site.
- Use the testing evidence to refine the archaeological strategy for the site.

5.2.1 Test Trench Locations

The archaeological test trenches have been located within the assumed zone of archaeological potential, a 70m wide portion west from the Hickson Road site boundary (Fig. 5.1). The test trenches will be located roughly in areas that correspond to historic structures as depicted on the 1875 plan (Fig. 5.2). The trenches are also located outside and away from extant buildings. Existing services have not been considered in the test trench design at this stage as they will be decommissioned prior to any testing work being undertaken.

5.2.2 Testing Methodology

- Test trenches will be excavated to a maximum depth of 2.5m below modern ground level. Current ground level is between RL 2.4 to 2.8m.
- Excavation will stop once the water table is reached. This is expected to be at RL 0.3 to 0.6m.
- In order to safely facilitate hand excavation and recording the trenches will be benched at a ratio of 1:1m.
- Trenches will be up to 10m in length and 6m in width. This will allow for a base working area of 8m by 4m and 2m in depth.
- In order to facilitate excavation the existing concrete hardstand will be cut to the designed dimensions.

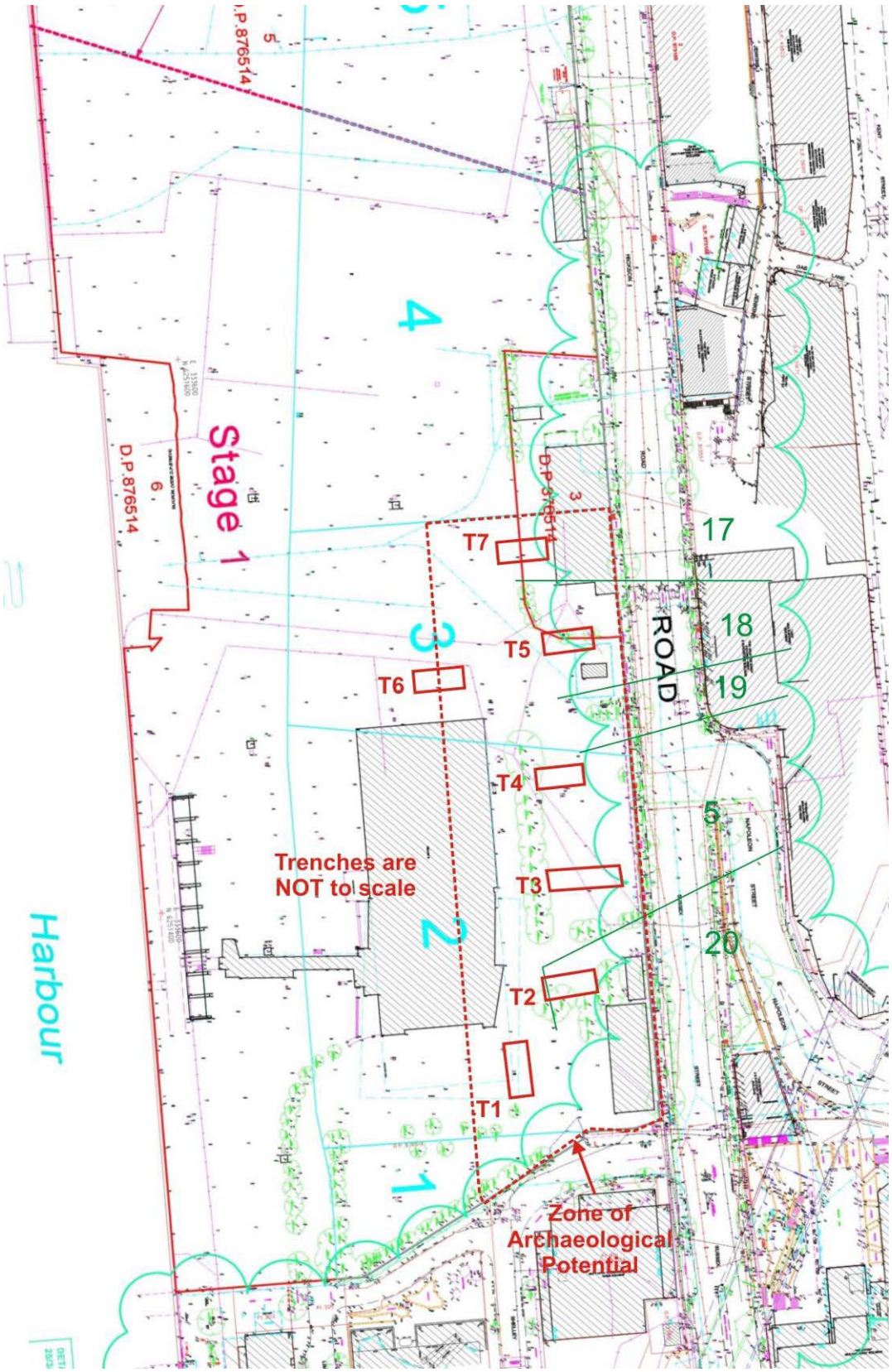

Figure 5.1: Plan showing the proposed location of test trenches in the eastern area of the site. Please note these trenches are not to scale.

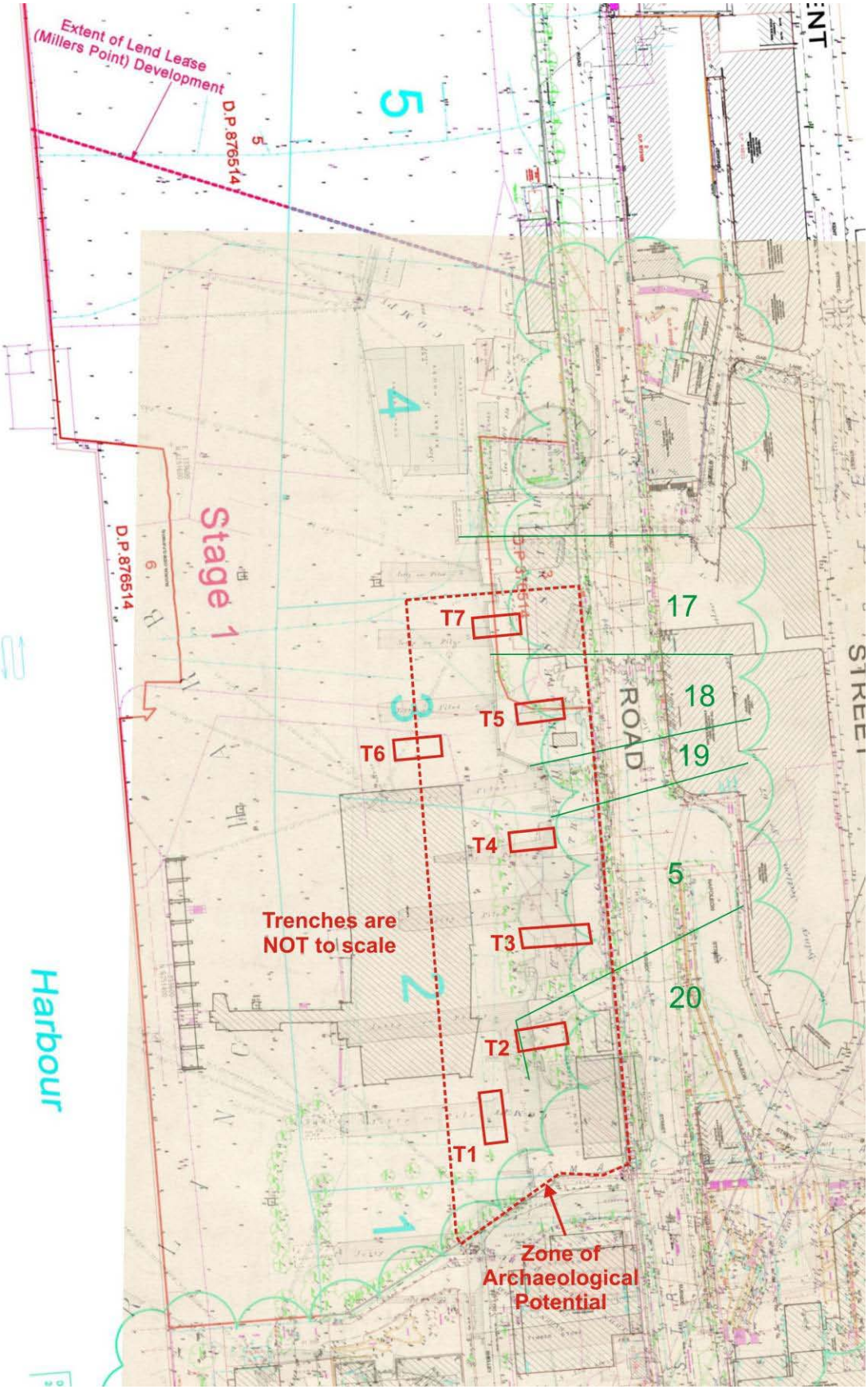

Figure 5.2: Overlay of modern plan with the 1875 plan showing the various test trenches located within individual portions. Please note these trenches are not to scale.

- Excavation will be undertaken by machine, under the supervision of the archaeologists.
- Once archaeological work has been completed, the trenches will be backfilled with the excavated material.
- Open trenches will be secured with temporary fencing.
- Concrete surface will not be reinstated.

5.2.3 Test Trench Outcomes

- All test trenches will provide information regarding the nature of the fills and the water levels. This will inform the archaeological program.
- T2, T3, T4 and T5 will test the evidence from the geotechnical bores and the accuracy of the levels of fill and natural.
  - **T1** Test for mid/late 19th-century wharfage survival
  - **T2** Test for archaeological survival in Portion 20
  - **T3** Test for archaeological survival in Portion 5
  - **T4** Test for mid/late 19th-century wharfage and Portion 5 survival
  - **T5** Test for archaeological survival in Portion 18 and nature of fills/possible contamination
  - **T6** Test the assumption of no archaeological potential beyond 70m from Hickson Road
  - **T7** Test for Portion 17 archaeological survival and nature of fill/possible contamination

5.3 Excavation Methodology

The focus of the excavation program will be on any intact remains found to survive within the eastern 70m of the basement which will be impacted by the proposed development. We note that the eastern 50m is likely to be the main focus of the archaeological program with some sampling in the next 20m. Our approach to the site will use a machine to open up areas to determine where potential remains are likely to be found.

When intact remains are found we will undertake detailed archaeological open area stratigraphic excavation with detailed recording including: scale drawing of plans and sections, photographing, videoing and contextual recording of the remains in line with current best practice and Casey & Lowe practices (see below).

Archaeological methodology in this area will require the use of machinery to remove the extensive overburden. The removal of fill will be monitored. Once appropriate levels are reached the archaeological remains will be hand cleaned using shovels, hoes, mattocks etc to expose the remains so they can be recorded in detail. Recording will include detailed GIS surveying of each area so detailed information can be mapped and recorded. Detailed plans will be drawn of structures and archaeological deposits and features.

In relation to the excavation of wharfs/jetties it will focus on recording a number of sections of mid and later 19th-century wharves within the footprint of the former Jetties 10-12. This would include those structures from the 1850s which were leased to the Flour, Tasmanian Steamship Coy, USS coy, ASN Coy and Union Steamship Co.

5.4 Contamination and the Archaeological Resource

5.4.1 Management of Contaminated Areas

Block 4
The letter from AECOM (Appendix 1) outlines the issues with the DECCW declared area of Block 4 and how the archaeological investigation of the former gasworks will be highly affected. As the archaeological work for this area is going to be impeded we will adopt the strategy used during archaeological works for the other part of the gasworks at 30 Hickson Road (GML 1999). This strategy was to monitor some machine excavation and limit recording to photos and possibly survey plans. There will be no hand excavation and cleaning as we would normally do to record a site. Archaeological staff will need to be suited up and wearing respirators. During various stages of recording the surviving archaeology within the gasworks this methodology must be reassessed in light of the findings associated with the contamination and the archaeology. This strategy may be amended in light of the results we get from the fieldwork. We may need to make a decision to discontinue the work if the results from this strategy are poor.

5.4.2 Block 3
There is contamination in the northeastern portion of Block 3 (AA Fig. 3.23) The AECOM letter (Appendix 1) identifies the nature of this contamination. They note that a 'more comprehensive program of archaeological excavation, mapping and recording would be possible, subject to the actual conditions encountered and the development and implementation of appropriate health and safety practices and systems'.

If conditions allowed it we would hope to be able to undertake open area stratigraphic excavation within the contaminated area of Block 3.

5.4.3 Hotspots in Blocks 2 and 3
There are some isolated hotspots within Blocks 2 and 3 (AA Fig. 3.23). These will need to be managed according to appropriate OH&S and the Remediation Action Plan (RAP) guidelines but we should still be able to undertake appropriate levels of archaeological excavation and recording.

5.5 Archaeological Management of Individual Areas
The substantial and significant archaeological resource is situated within the eastern 70m strip extending out from Hickson Road. This includes the remnant foreshore, the early reclamations, Henry Bass' boatyard (c1819-c1853), and 19th-century wharfage and associated seawalls and remaking of the landscape.

5.5.1 Block 1
Block 1 contains some remains of 19th and 20th-century jetty piles and associated deposits but there are no seawalls or land-based archaeological components within Block 1. These types of jetty piles are better represented elsewhere within the development area. We are proposing to sample remains of jetties within Blocks 2 and 3 rather than Block 1. Therefore the impact on the basement is not considered to be significant nor does it warrant archaeological excavation, recording or monitoring.

5.5.2 Block 2
Block 2 contains a significant archaeological resource, potentially of State and local significance. This area will be subject to a targeted sampling excavation of foreshore and adjacent areas of Portions 20 and 5 to find and record the remains associated with the identified phases in the assessment, mostly Phases 4 to 9 which occur within these two portions (See AA Section 3.3). Of note in this area are the reclamation and subsequent

structures associated with Prosper de Mestre and later Francis Girard. From the 1840s this area became part of extensive wharfage which was upgraded and rebuilt during the subsequent period.

5.5.3 Block 3

Block 3 contains a significant archaeological resource, potentially of State and local significance. This area will be subject to a targeted sampling excavation of foreshore and adjacent areas of Portions 19, 18 and part of 17 to find and record the remains associated with the identified phases in the assessment, mostly Phases 3 to 9 which occur within these historic portions (See AA Section 3.3). Of note in this area are the potential remains of Henry Bass's early shipyard (c1819-c1853), as well as various reclamations and wharfage.

5.5.4 Block 4

As discussed above the contamination will impact on how it is possible to record the potential archaeological remains of the gasworks within this property.

5.6 Archaeological Methodology

5.6.1 Open Area Stratigraphic Excavation Methodology

The basic principles of open area stratigraphic excavation to be employed on this site are:

- use of machinery to open up areas and to undertake testing.
- where remains are found undertake open area stratigraphic excavation and recording.
- use of context recording forms and context numbers to record all archaeological information.
- use of Harris matrix as part of the recording program.
- underfloor deposits will be recorded within a 50 cm grid, 5 cm spits and 100% sieved.
- well and cesspits will be excavated in 20 cm spits or tip lines (if identifiable), with changes of context numbers where relevant. These deposits will be sieved.
- all structural remains, post holes, and features will be planned.
- detailed survey and GIS mapping of the area.
- detailed photographic and video recording.
- generally all artefacts will be collected except from unstratified fills; samples of bricks and mortar will be collected from the structures.
- collection, labelling, safe storage, washing, sorting and boxing of artefacts.

5.6.2 Testing Methodology

Some preliminary test holes will be excavated in appropriate areas as outlined in Section 5.2 above. Test holes will be used to determine the nature and depth of fills down to the main historic-period remains and future actions that may be required.

Testing will focus on those areas considered likely to contain remains. There will also be a need for testing in areas across the site so as to understand the fills and further inform the predictive model of archaeological potential. Test holes will be recorded individually and across the site.

5.6.3 Archaeological Monitoring Methodology

Archaeological monitoring is a methodology we would use where testing has had no substantive result and there is a low expectation that archaeological remains are present but because there is still some possibility that isolated features such as structures, features or deposits may survive and if they did would be of significance. This is the most feasible way to recover them. Monitoring involves an archaeologist or archaeologists being present during bulk excavation of the upper layers (those which may have potential to contain

remains) of the site. If relics are found then the work will need to stop in that area so that the archaeologists can investigate the area to determine what has been found. Some use of machinery may be required to assist in this process. Bulk excavation of this isolated area can only recommence once the archaeologists are satisfied that they have completed excavation and recording of the remains. Meanwhile bulk excavation can continue in other areas.

5.6.4 Recording Methodology

- establish 20 m grid for site.
- use of GIS surveying techniques for locating remains and producing large scale plans.
- detailed archaeological scale plans for main areas.
- photographic and video recording.
- analysis of fabric and detailed recording of the remains on context sheets according to best practice standards.

5.6.5 Public Interpretation of the Archaeological Program

As these remains are of significant it is considered important that the general public is given the opportunity to see the remains as well as know about them. Suggested ways in which to disseminate information about the site, the history of the site, and the archaeological results are:

1. Place signs on the fence indicating the presence of the archaeological site to the public and provide contact details for further information about the site.
2. Make available a public information leaflet about the site by:
   - placing copies of the leaflet on the fence so the members of the public can take it away with them.
   - placing the information leaflet on Casey & Lowe's webpage so there can be wider distribution of information about the archaeological program.
3. Provided regular updates on the results of the archaeological program on Casey & Lowe's webpage or another alternative webpage, such as the developer and/or the Barangaroo Delivery Authority.
4. Media release(s) during the archaeological program to update the public with progress on the site.
5. Hold an Open Day with public tours of the site. The client will need to cover issues of site safety and insurance for such a day. The number of Open Days it is considered appropriate to hold will depend upon the extent of the remains and advice from the NSW Heritage Branch.

5.6.6 Public Interpretation

The history of the site and the results of the archaeological program need to be interpreted as part of the Interpretation outcomes for the site and as identified in the commitments.

5.6.7 Aboriginal Archaeology

Testing for Aboriginal archaeology will be undertaken following completion of the historic-period archaeological program in some of the areas and be coordinated in others. The archaeological work for Aboriginal archaeology will be directed by Jillian Comber, Comber Consultants, in consultation with the representative Aboriginal groups.

5.6.8 Personnel

Appropriately qualified personnel to be involved in the excavation stage of the project include:

- Excavation Directors: Tony Lowe and Mary Casey
- Site Director: Abi Cryerhall,
- Main site team: Mike Hincks, Amanda Dusting, Beau Spry, Rowan Ward, Stirling Smith and many others

Artefact specialists: Rowan Ward, Robyn Stocks, Jeanne Harris and others.

We are likely to have at least three teams going at the one time so as to expedite the archaeological program and allow Bovis Lend Lease access to the southern part of the site. Numerous other archaeologists will be employed but it does depend on the availability of people when the work commences.

5.6.9 Artefact Cataloguing Methodology

The artefacts from the site will be the subject of a detailed cataloguing and analysis program in line with Casey & Lowe's current practices. All artefacts will be catalogued by specialist cataloguers in the system designed by Casey & Lowe and used on all their excavation sites. An example of this was recently published and spreadsheet versions are available on our webpage.[2] An important component of the cataloguing is the use of minimum item or minimum vessel counts. The faunal material will be entered into a database designed by Dr Sarah Colley for Casey & Lowe. Where relevant, specialists will produce reports on the artefacts outlining issues of importance. These typically are: ceramic, miscellaneous, building materials, glass and bone and shell.

In addition, important artefacts will be the subject of materials conservation. This would include gluing of important and/or early pottery and conservation of important metal artefacts and where there are significant leather materials.

5.6.10 Excavation Report

Casey & Lowe are well aware of the importance of producing excavation reports that respond to the conditions of the excavation permit and add to general knowledge. We are aware of current research trends in history and archaeology and regularly attend conferences where these issues are discussed. We have an extensive archaeological reference collection and read widely in these areas.

- Excavation reports have to conform to the conditions of consent attached to the Excavation Permit Application.
- The excavation report needs to be well structured and consist of three main stages:
  - **Description** of the archaeological remains including both structures and contexts and phases of occupation. This should include a stratigraphic matrix of the archaeological contexts.
    - These are typical presented in a series of trench reports which present the detailed information collected during excavation.
    - Overall synthesis of the results based on the information in the trench reports but presenting an overview of the results.
  - **Analysis** of the artefacts utilising a computer database for the catalogue. Analytical techniques used should reflect the research questions and be presented graphically. Analysis needs to respond to the archaeological contexts in a meaningful way. If the site includes residential occupation then the households must be analysed individually and then compared to each other.
    - Artefact specialist reports presenting a detailed overview of what has been found with analysis of this work.
  - **Interpretation** of the description and analysis should address the research questions and with a detailed response to the research design. Excavation reports are usually written by one of the principal consultants in association with the site supervisors and artefact specialists and reviewed by the other principal consultant. Where both principal consultants are responsible for writing a report there is considerable discussion during the analysis and interpretation phases.

[2] Casey 2004; http://www.caseyandlowe.com.au/sydney.htm - Click on specific projects as well as the Parramatta group.

6.0 Research Questions

6.1 Research Questions

This section provides a preliminary indication of the type of research questions that might be pursued to investigate the archaeological remains at the site.

6.1.1 Shipbuilding[3]

One of Governor Phillip's instructions for the foundation of Sydney was that he should '...not on any account allow craft of any sort to be built for the use of private individuals...'.[4] The primary reason for this was to ensure that Sydney did not become a centre of trade and threaten the monopoly of the East India Company. The first British vessel built in Sydney was *The Rose Hill Packet* in 1789.[5] This vessel, however, was a Government-owned craft and was the first Parramatta River ferry. It was commonly known as *The Lump* because '...as from the quantity of wood used in her construction she was a mere bed of timber'. This observation is less a criticism of the skills of the shipbuilders but on the overcompensation in the construction due to the as yet unknown physical properties of the local timbers.

With the establishment of satellite settlements on the Hawkesbury River and Norfolk Island, the Government found it necessary to establish a yard where ships could be built and repaired. This started on the western side of Sydney Cove (Circular Quay) in 1796.[6] This was the first formal shipyard in Sydney. A second, private, shipyard named Underwood's yard was built around four to five years later on the western shores of Sydney Cove.[7] Another yard, owned by Campbell & Co., was operating around 1810.

Up until 1813, no vessel had been built in the colony of New South Wales without the permission of the Governor.[8] After that date this restriction, and the restriction to trade beyond the limits of the colony, was removed which allowed for unhindered development of the Sydney shipbuilding industry. In 1833 the Government Dockyard, on the western side of Sydney Cove, was closed and as the upper part of the Cove silted up the focus for shipbuilding moved westwards to Darling Harbour (such as the Cuthbert, Barclay and Corcoran yards) Johnstons Bay and Pyrmont (such as the Thomas Chowne, J.W Russell and Samuel Charles yards).[9] The Government continued its direct involvement with the industry with the repair of the HMS *Blanche* in 1839 at Cockatoo Island, which employed 80 to 100 shipwrights.[10]

In the 1830s, with the increasing frequency of settlements along the coast north of Sydney, there was an increased demand for coastal shipping. This in turn led to a need for smaller tonnage vessels. Shipyards were also constructed along the major rivers of the Central and North Coast where good quality timber (cedar) was easily accessible. Newly launched vessels for these yards were loaded up with this timber and shipped to the main shipyards in Sydney. Australian built vessels in the 1830-40s were less expensive to build than British

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[3] This section provided by Cos Coroneos, Cosmos Archaeology Pty Ltd.
[4] Watson 1919:97.
[5] Watson 1919:98
[6] Tony Lowe, Director, Casey & Lowe has undertaken archaeological work on this site for more than 15 years. He recently completed an Archaeological Management Plan for the site as part of a Part 3A application for redevelopment of the site. Dr Rosemary Annable wrote the history for this report. Casey & Lowe 2009.
[7] Watson 1919:100; 104
[8] Proudfoot 1983:76
[9] Watson 1919:114
[10] The Australasian Shipping Record, April/June 1994:90

vessels, however, North American built vessels were starting to appear on the market and these were considerably cheaper than the local product.[11]

Despite competition from American shipyards and no doubt stimulated by the Gold Rush, by 1854 the colonial shipbuilding industry was at its peak. Associated with the yards were service industries as well as of course a substantial skilled and unskilled labour force. The most intensive land uses for shipbuilding occurred along the northern foreshores of Darling Harbour with boat and shipbuilders also being established in Pyrmont and Balmain. Most of the service industries, ship smiths, anchor smiths, block and mastmakers, chandlers and sailmakers, however, were located on the eastern periphery of Darling Harbour.[12] Bass's shipyard appears to have been one of around a dozen shipyards and shipwrights in Darling Harbour in the early 1850s and it does not appear to have been a major yard. [13]

Shipbuilding was one of Sydney's, if not Australia's, earliest industries. Directly it employed a large workforce and ancillary industries. Its products, the ships, carried supplies and people to settlements that were being created along the coast. The availability of coastal shipping facilitated the increase in settlements. In turn the resulting increases in the volume of the goods and passenger trade required more shipping which led to the expansion of the shipbuilding industry in the 1840s and 1850s. Watson was not exaggerating when he stated in 1919, 'from the earliest days of settlement shipbuilding was commenced, and the development of the country was largely due to the locally built ships'.[14]

Corresponding with the increase in the number of vessel's plying the southern and eastern coasts of Australia in the 1830s and 1840s was an unfortunate and disproportionate increase in the number of shipwrecks. The causes for this phenomenon have been sought in the dangers of a relatively unknown and unlit coastline, poor seamanship, building practices or the scarcity of quality materials (other than timber).[15]

With respect to the latter causes, the wrecks of early Australian-built vessels are rare, more often than not very poorly preserved as well as difficult to access for examination.[16] The other source of archaeological information, early Australian shipbuilding sites, could provide some insights into the manner in which the vessels were constructed and the quality of their craftsmanship. To the best of our knowledge no archaeological investigation of a Sydney shipyard from the 1830s to 50s has been published or is otherwise available. On a national level the only early shipbuilding sites known to have been investigated in detail are the government yards in Port Arthur and Sarah Island.

Specific Research Questions

The research question that can be used to investigate the archaeological remains from Bass's shipyard is whether they can say something about the variety and quality of shipbuilding that took place on the site over time. This in part can be answered by the examination of discarded fittings and tools on the site, as well as timber off-cuts. The arrangement of the work space such as the relationship of the slipway(s), sail loft, saw pits, forges and other features can say much about organization and efficiency. Of interest would be to see if some features such as saw pits and forges were absent from the site as this would demonstrate the interconnectedness, or otherwise, of the shipyards in Darling Harbour with other local businesses. The archaeological remains of the shipyard may also

[11] Bach, J. 1976:76; Jeans 1974 60(3):158
[12] Proudfoot 1983:73
[13] Proudfoot 1983, Fig. 1
[14] Proudfoot 1983:96
[15] Coroneos, C. 1991:2
[16] Bullers 2006.

in part provide some insight as to why the shipyard closed down in what was a boom period for the local shipbuilding industry.

6.1.2 Maritime infrastructure[17]

Prior to Federation the overwhelming majority of maritime infrastructure in Darling Harbour was in private hands. It was built to suit the individual requirements of the private firms that owned them 'without system and without regard to future expansion'.[18] This cacophony of odd shapes and sizes led to congestion and inefficiencies on the waterfront. Though some individual larger firms may have fared well in this system the economic benefits of the seaborne trade to the wider society were not fully exploited. With the rapidly increasing dimensions of vessels, the capital needed to construct larger jetties with deeper berths was beyond the means of most of the jetty owners. The required size of these new jetties was such that a number of earlier ones would need to be demolished to be replaced by a single jetty and the necessary cooperation between jetty owners was not automatic. The inability to react quickly to changes in shipping technology would eventually see Sydney become a less competitive port of trade.

The opportunity for change and direct government takeover of the waterfront came with the appearance in the bubonic plague in 1900. The porous state of the seawalls and fences along the waterfront created a portal for plague-carrying rats to enter the city. The traditional design of seawalls in Sydney in the 19th century was the laying of ballast (rock fill) up to the low water mark, which formed a foundation. Upon this foundation the sea wall was constructed either from masonry or hand packed rubble. In some locations in Darling Harbour where the silt was soft and deep, sheet piling composed of Turpentine was employed instead of ballast and masonry. Piles were driven deep into the silt, tied back at the top with timber beams and filled in with rubble and soil to wharf level. The piles, however, were not sided as it was believed that the bark and sapwood provided good protection against marine borers. This method of construction meant that there were gaps between the piles. With the sea washing in amongst the piles there was continuous subsidence as the reclamation fill was washed out. Furthermore, 'the wide interstices and the hollows that formed behind the piles became rat warrens'.[19]

The government believed that the individual firms that owned the jetties and seawalls were unable or unwilling to expend the capital to rat proof their structures and that facilities which were run down were a public health risk. With the resumptions of the waterfront the government moved quickly. The Sydney Harbour Trust, established in 1901, decided 'to seal the front to a foot below low water mark with Monier plates to prevent the passage of rats…the result was entirely successful, and the water front was vastly improved in appearance'.[20]

The resumption of the Sydney waterfront in 1900 was a momentous event, which defined the character of shipping, commerce, the lives of those who worked on the waterfront and of Sydney Harbour itself for the new century. The catalyst for this change was the poor condition of the waterfront and the health risk it posed for the city's inhabitants.

Specific Research Questions

Barangaroo Stage 1 provides an excellent opportunity to explore the transformation of a section of the Darling Harbour waterfront from the early 19th century to the government takeover in 1900 and then into the 20th century.

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[17] This section provided by Cos Coroneos, Cosmos Archaeology Pty Ltd.
[18] Walsh 1911:79
[19] Walsh 1911:87.
[20] *Sydney Harbour Trust Annual Report*, 1903 and 1904

- Of interest would be the comparison between the quality of public versus private infrastructure, quality both in materials and construction. For example, was Turpentine, an excellent hardwood resistant to marine borers, consistently used? If lesser quality timbers such as Ironbark were used as piles, were they copper sheathed (a protection against marine borers)?
    - Documenting the quality of the jetties, seawalls and other maritime infrastructure constructed by private firms would provide insight into the attitudes of those firms.
    - Did high quality structures indicate confidence and a willingness to invest for the long term?
    - Did poor quality and poorly maintained structures reflect a struggling owner or one that did not see it economically beneficial to build durable infrastructure on their property or lease? Did the maintenance and condition of the waterfront infrastructure drop off towards the start of the 20th century?
    - If so, how much was this due to the 1890s depression and/or to owners realising that the government was looking at resumptions encouraged them to reduce expenditures in maintaining their structures; thereby providing the government more justification for taking over.

6.1.3 Industrial Archaeology

The main industrial site within the study area is the AGL gasworks. This site has a number of phases from its establishment in 1839 to its resumption in 1900 and eventual redundancy by 1918. Questions about the industrial sites within the study area relate to both the technological nature of the sites and the evidence for work place practices as well as issues of urbanisation and concentration of work and living arrangements in close proximity. Rosemary Broomham states that the actual technology for extracting gas from coal did not change during the time the works operated on this site. It is noted that no AGL plans of the gasworks have survived (p.14) though there are numerous historic plans showing the expanding layout of the gasworks.

Questions that relate to the technology of the gasworks could include:

- Expansion and reclamation of gasworks land and how the landform was transformed to allow for the operations of the gasworks such as the staged reclamation of waterfront for wharfage and to provide more land for gas production as there was no ability to expand to the east.
- Basic technology included:
    - Heating coal in a sealed oven or retort
    - Cleaning the resulting gas of impurities
    - Storing the gas in a gasholder
    - Distributing the gas to consumers.
- Spatial use of the gasworks, identification of activity areas,
    - retorts
    - coal washing
    - purifiers
    - gas holders
    - carbonising plant
    - tar tanks
- Levels of technology evident in the various processes of gas-making undertaken within the works.
- Evidence for the working conditions of the staff.

Other relevant questions as they arise.

6.1.4 Landscape Archaeology

The exploration of how the landform of Darling Harbour was altered between c.1810 and 1980s is fascinating as it testifies to the need for more land in specific locations and to provide adequate drafts for shipping. This represents the development of urban pressures as early as the 1830s to concentrate industry with the main transport network, shipping, so as to aid distribution of their products and the importation of the goods they need. The ability of people to suddenly be able to transform mud flats into useful land and be able to add on wharfage that is then far enough into the harbour to provide safe mooring for ships bringing in cargo and taking away produced goods. The alteration and manipulation of the landform of Darling Harbour has been part of its story for the last 212 years. The methods and means by which the landform was altered can tell us much about attitudes to waste and rubbish disposal, deposition of waste from other construction projects, such as the reclamation of nearby areas in the 1920s and the study area in the 1950s and 1960s with material excavated from elsewhere and dredged from the harbour.

- What was the nature of the original landform, evidence for shells, such as cockles and oysters, and what plant species were found in this area?
- How has this part of Darling Harbour evolved over time?
- How many times was the landform been remade within the study area?
- What different materials and means were used, and what was the depth of the reclamation at each stage? How different was it to the practices at the Darling Walk and KENS Sites.
- Were the phases of reclamation successful or not?
- Were the different properties reclaimed at different times?
- Where did the reclamation fill come from?
- How was the new landform used?
- What was the relationship between the reclaimed land and the wharfage?
- Other relevant questions as they arise.

The intention of this section is to provide a context for assessing the significance of the archaeological resource. This section will be superseded by the Research Design and Management Strategy report which is a recommendation of this report and a requirement of the Commitments. Though the final research design will draw on the substance of the above section.

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Appendix 1: AECOM Letter re archaeology and contamination

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18 May 2010

Mr Warwick Bowyer

Lend Lease (Millers Point) Pty Ltd
30 The Bond
30 Hickson Road
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Dear Warwick,

Barangaroo Stage 1- Archaeological Assessment : Environmental conditions encountered during Data Gap Investigations within VMP and PDA Remediation Works Area and Other Remediation Works (South) Area

AECOM Australia Pty Ltd (AECOM) has been engaged by Lend Lease (Millers Point) Pty Ltd (LL) to undertake Data Gap Investigations (DGIs) and remediation design works for the Stage 1 Barangaroo project in accordance with the Professional Services Agreement (PSA) between the parties dated 20 November 2009.

LL has requested that AECOM provide information regarding encountered Site conditions within the Voluntary Management Proposal (VMP) and Project Delivery Agreement (PDA) Remediation Works Area and Other Remediation Works (South) Area (refer attached figure) for provision to the LL appointed archaeologists (Casey and Lowe) in order that they can:

- Determine a preferred, and where appropriate, approach to the undertaking of preliminary test pit exploratory works, subsequent archaeological excavation, recovery and recording of potential archaeological deposits (both of a European and Indigenous nature) during the proposed ex-situ remediation works, noting that the remediation area is likely to be contaminated; and
- Document the preferred approach in the Archaeological Assessment and Research Design reports associated with Barangaroo Stage 1.

Relevant information relating to the above considerations is provided in the following sections.

1.0 VMP and PDA Remediation Works Area

In May 2009, the NSW Environment Protection Authority (EPA) determined that the land encompassed by the former Millers Point gasworks was contaminated in such a way as to present a **significant risk of harm (SROH) to human health and the environment**. As a consequence the EPA declared the Site to be a remediation site (Declaration Number 21122; Area Number 3221) under section 9 of the Contaminated Land Management Act 1997.

The land to which the declaration applies is described as:

- Part Lot 5 and Part Lot 3 in Deposited Plan (DP) 876514, Hickson Road, Millers Point.
- The part of Hickson Road adjacent to:
  - 30-34 Hickson Road being Lot 11, DP 1065410;
  - 36 Hickson Road being Lot 5, DP 873158 and Lot12, DP 1065410; and
  - 38 Hickson Road being SP72797, Millers Point in the City of Sydney Local Government Area.

1.1 Nature of contamination

The EPA declaration notes that the VMP and PDA Remediation Works Area is contaminated with gasworks waste and particularly waste tar resulting from the historical use of the land as a gasworks plant. The chemical composition of gasworks waste includes the following contaminants of potential concern (CoPC):

- polycyclic aromatic hydrocarbons (PAHs);
- benzene,
- toluene, ethylbenzene and xylenes (BTEX);

- total petroleum hydrocarbons (TPHs);
- ammonia;
- phenol; and
- cyanide.

Groundwater has been found to be contaminated by TPHs, PAHs, BTEX, ammonia, phenol and cyanide at concentrations exceeding the relevant trigger values for the protection of human health and aquatic ecosystems in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).

1.2 Data Gap Investigation

AECOM is currently completing a DGI within the VMP and PDA Remediation Works Area, which has considered information obtained during previous investigations. As a result, the nature, distribution and concentrations of contamination within this area are well documented.

The DGI has identified concentrations of CoPC including lead, TPH (C6-C9 and C10-C36), BTEX compounds, PAHs (including benzo(a)pyrene) and sulfate within soil and fill materials variably exceeding the adopted Site Investigation Criteria. Concentrations of some semi-volatile organic compounds (SVOCs) exceeding the laboratory limit of reporting (LOR) were also reported. The reported results are generally consistent with the findings of previous investigations with respect to the identified CoPC.

Dissolved-phase concentrations of contaminants were variably reported above the Site investigation criteria (e.g. lead, cadmium, chromium, cobalt, copper, mercury nickel, zinc, benzene, naphthalene and phenol) in groundwater.

Reported soil vapour results indicated some gasworks-derived impacts in locations closest to the former gasworks area and low concentrations of toluene, chloroform and tetrachloroethene (below soil vapour guidelines) in some locations. The reported results were below the Site investigation criteria with the exception of naphthalene which reported soil vapour concentrations exceeding the ambient air screening criteria (3.7 $\mu g/m^3$) in eight locations and the adopted soil vapour screening criteria (37 $\mu g/m^3$) in five locations.

The highest concentrations of soil, soil vapour and groundwater contamination were identified in the immediate vicinity of the former gasworks infrastructure.

1.3 General description of Encountered Conditions

Fill and Soil

Encountered stratigraphic conditions were variable across the VMP and PDA Area, but generally comprised fill material overlying natural weathered sandstone with clay components. Sandstone bedrock was generally present underlying natural weathered bedrock materials or in some instances directly underneath fill materials. Observations of odours, staining and sheen were generally more common in the overlying fill materials, although they were also noted within a number of locations within the natural soil and bedrock present on the Site.

Fill materials were generally shallower in the eastern portion of the Site closest to Hickson Road and deeper in the western portion of the Site. The thickness of fill material generally increased from east to west across the Site.

Observations during the test pitting works identified the presence of unconsolidated, highly variable fill materials, which generally comprised unconsolidated gravels, sand, bricks, sandstone, timber, slag and steel. Visual signs of contamination including black staining, tar and surface sheen (where groundwater was present) were noted in several test pits, predominantly located in the footprint of the former Retort House and Purifying Beds within Block 4.

Natural soils encountered across the Site comprised silty sands, gravelly sands, clays, weathered sandstone and sand with components of clay.

Tar was generally (but not exclusively) encountered within fill materials and was characterised by a strong naphthalene odour, black colour and a viscous consistency. Where hydrocarbon impact was detected in groundwater a surface sheen and odour were also identified. Tar mixed with groundwater was identified in the tar tank, located underlying Hickson Road. The material within the tar tank was black, odorous and unspadeable.

Groundwater

Groundwater was encountered within the fill materials and underlying natural material. Groundwater was encountered at depths ranging from 1.38 to 2.92 m below ground surface (bgs) and is subject to tidal fluctuation. Water level monitoring within selected wells over a three day period confirmed that groundwater at the Site is tidally influenced, with the influence extending as far east (inland) as Hickson Road, although the degree of fluctuation is much less on the eastern portion of the Site towards Hickson Road.

Free phase tar was reported in several wells located within the footprint of the former gasworks site. Tar was observed within wells installed at varied depths throughout the profile, indicating dense non aqueous phase liquid (DNAPL) is present at the Site within the fill materials, natural sediments and bedrock.

1.4 OH&S Considerations

The nature of the contamination within the VMP and PDA Remediation Works Area is likely to prohibit the type of detailed excavation and recording practices associated with conventional archaeological excavations. It would also likely prohibit the specific requirements for the investigation of Indigenous archaeology, which AECOM understands may involve hand excavation, machine excavation and wet sieving of natural sands to collect artefacts, within the DECCW declared area.

AECOM understands it is proposed that a limited program of archaeological photographic recording/mapping is being considered within the VMP and PDA Remediation Works Area associated with Stage 1, and that the timing of these works is such that they will be undertaken in parallel with the proposed remedial works. The proposed archaeological works are associated with the former gasworks that once occupied the site.

Based on the nature and concentrations of reported contamination, AECOM notes that specific Occupational Health and Safety (OH&S) considerations will apply to the remediation works being undertaken. The remediation of gasworks waste is complex and requires appropriate consideration and management of chemical and other hazards. Remediation activities will only be undertaken following the completion of a rigorous OH&S plan incorporating a risk assessment and development of detailed management protocols for the proposed works.

AECOM notes that remediation works will likely be undertaken within an exclusion zone that will require additional protective measures to be taken. These measures may include the use of specialist equipment including respirators, air monitors and coveralls and will require adherence to appropriate decontamination practises.

The remediation works will entail the use of heavy machinery which will present a potential risk to the safety of Site workers. As such, the number of workers within the exclusion at any one time will be kept to a minimum to reduce the potential for health and safety incidents

The preferred approach to risk management would be to minimise the number of archaeological practitioners accessing the remediation area and for the archaeological works within this area to be restricted to photographic recording and associated mapping only, which is considered more appropriate given the nature of the hazardous environment expected during the remedial works within the Stage 1 VMP and PDA Remediation Works Area. Following the completion of appropriate inductions and subject to careful planning and management, limited archaeological works such as photographic recording and limited mapping in parallel with remedial works might be appropriate. Such works will need to be undertaken under the direct supervision of a specialist remediation contractor, and on the proviso that the archaeological practitioners are adequately trained and strictly conform to the appropriate health and safety management systems and practices implemented by the specialist remedial contractor. Only authorised personnel and equipment will be allowed into the exclusion zones and other areas associated with the remediation works.

2.0 Other Remediation Works (South) Area

The Other Remediation Works (South) Area (ORWS Area) is located to the south and west of the VMP and PDA Remediation Works Area and is outside the footprint of the former gasworks area. Consequently, concentrations of CoPC, although still present, were generally reported at concentrations below that identified within the VMP and PDA Area.

Encountered soil and fill conditions were generally similar to the VMP and PDA Area, although no evidence of liquid tar was identified.

AECOM considers that as reported concentrations of CoPC are not as high as the VMP and PDA Area, the ORWS Area will not require the same level of OH&S management. As such, a reduced level of personal protective equipment (PPE) than is considered necessary for the VMP and PDA Remediation Works Area may be adequate for works in this area. This will be subject to verification of the actual conditions encountered during archaeological excavation works.

It is noted that AECOM is currently preparing a Human Health and Environmental Risk Assessment (HHERA) for the VMP and PDA Remediation Works Area, which will be applicable to the ORWS Area. The HHERA will need to be considered in the context of the archaeological works being proposed at this location prior to the development of specific safe work procedures for this area.

Within the Other Remediation Works (South) Area (ORWS Area), AECOM considers that a more comprehensive program of archaeological excavation, mapping and recording would be possible, subject to the development and implementation of appropriate health and safety practices and systems which would be informed by the abovementioned HHERA. Such systems may include the utilisation of appropriate personnel protective equipment by archaeological practitioners and the environmental monitoring during the archaeological test pitting and excavation phases by appropriately qualified environmental practitioners to ensure exposure to in situ contaminants is within acceptable levels.

3.0 Recommendation

3.1 VMP and PDA Remediation Works Area

Given that the Stage 1 archaeological works within the VMP and PDA Work Areas are to be undertaken in parallel with the proposed ex situ remedial works, it is recommended that:

1. The nature of any future proposed archaeological works associated with the Archaeological Assessment and subsequent Research Design be restricted to photographic recording and associated mapping to limit exposure to contamination;
2. Given Recommendation 1, it is considered that it will not be practicable to remove artefacts or soil samples from the VMP and PDA Work Areas;
3. Development and implementation of appropriate health and safety practices and systems be undertaken; and
4. Archaeological practitioners be trained in these practices prior to entering the remediation work areas under the supervision of the specialist remedial contractor.

3.2 Other Remediation Works (South) Area

Within the Other Remediation Works (South) Area (ORWS Area), a more comprehensive program of archaeological excavation, mapping and recording would be possible, subject to the actual conditions encountered and the development and implementation of appropriate health and safety practices and systems which would be informed by the abovementioned HHERA.

We trust this provides the necessary information you require. Should you have any further queries, please contact the undersigned.

Yours sincerely,

AECOM Australia Pty Ltd

Anthony Davis
Senior Environmental Scientist

Brad Eismen
Technical Director - Environment

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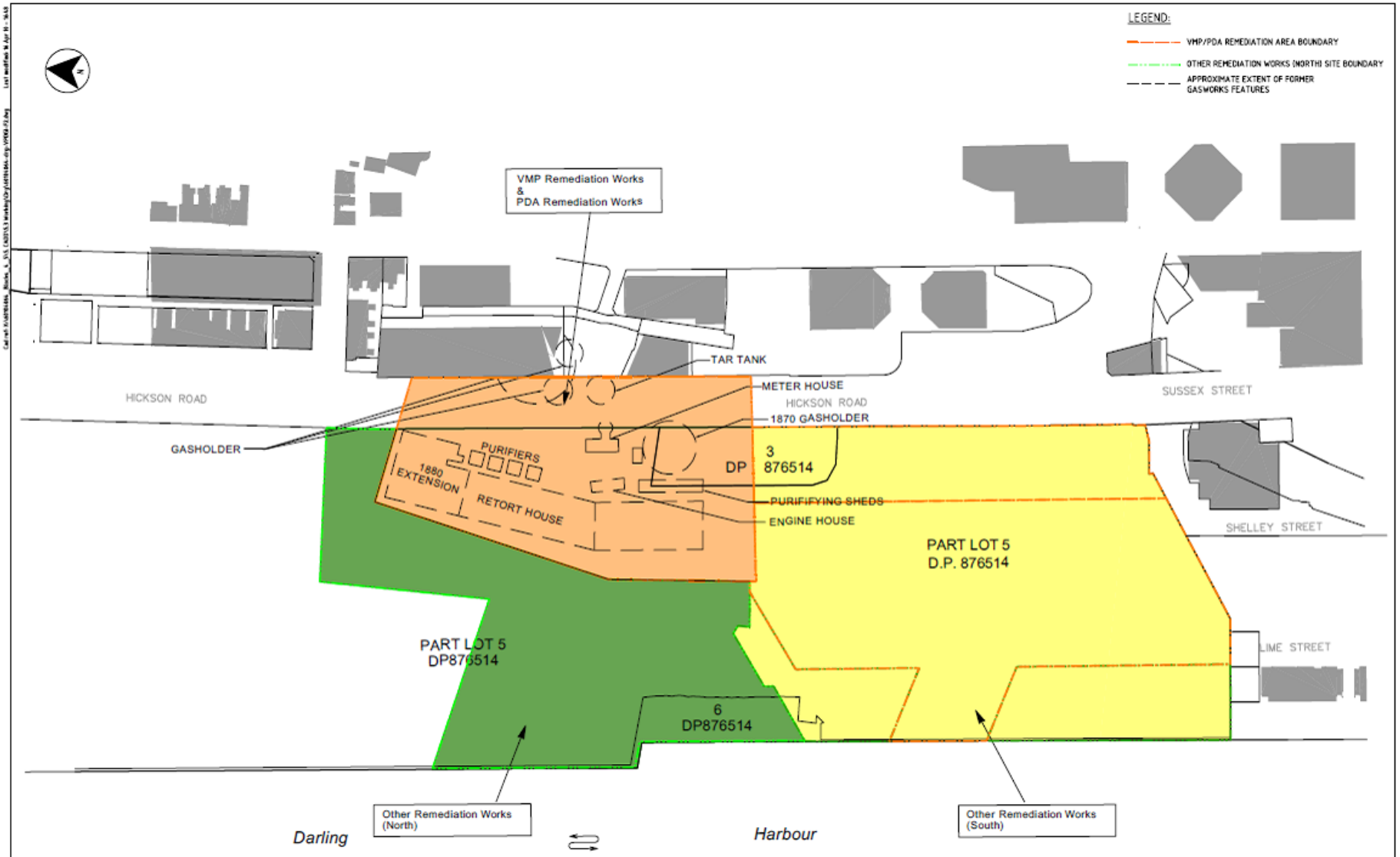

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VMP AND PDA REMEDIATION WORKS AREA DGI

SITE LAYOUT AND SURROUNDING AREA
FIGURE F2

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Casey & Lowe