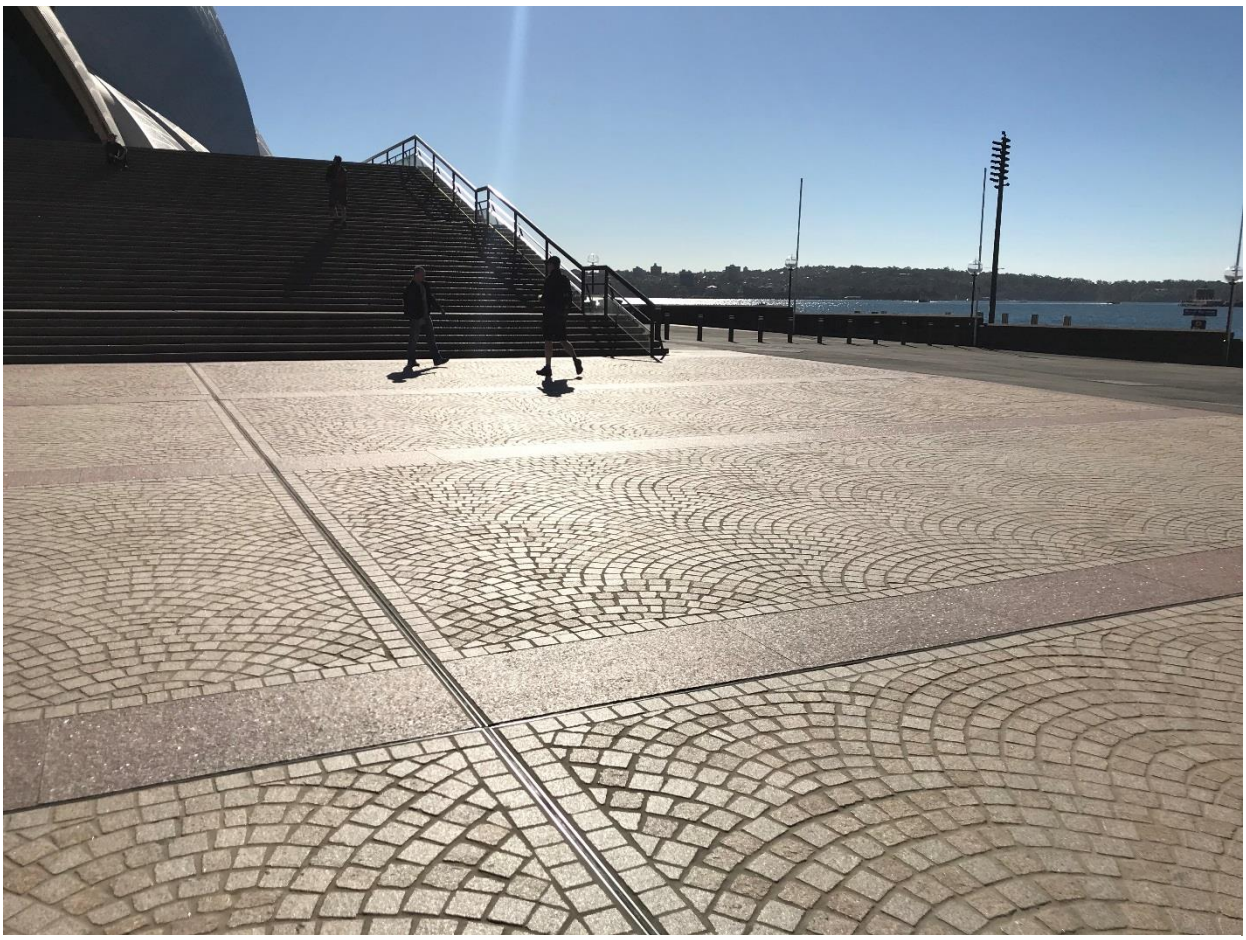
Sydney Opera House Forecourt Excavation

Historical Archaeological Assessment and Management Plan

Report prepared for Sydney Opera House

June 2018



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Report Register

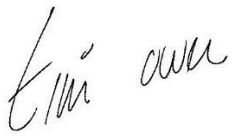
The following report register documents the development and issue of the report entitled Sydney Opera House Forecourt Excavation—Historical Archaeological Assessment and Management Plan, undertaken by GML Heritage Pty Ltd in accordance with its quality management system.

Job No.	Issue No.	Notes/Description	Issue Date
18-0311	1	Draft Report	25 May 2018
18-0311	2	Final Report	22 June 2018

Quality Assurance

GML Heritage Pty Ltd operates under a quality management system which has been certified as complying with the Australian/New Zealand Standard for quality management systems AS/NZS ISO 9001:2008.

The report has been reviewed and approved for issue in accordance with the GML quality assurance policy and procedures.

Project Manager:	Dr Tim Owen	**Project Director & Reviewer:**	Abi Cryerhall
Issue No.	2	**Issue No.**	2
Signature		**Signature**	
Position:	Senior Associate	**Position:**	Senior Associate
Date:	22 June 2018	**Date:**	22 June 2018

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1.0 Introduction

1.1 Preamble

As part of the Sydney Opera House (SOH) forecourt works, a thrust block needs to be installed within the forecourt area. The project was approved as State Significant Development (SSD) #7665, with Section 60 approval from the Heritage Council of NSW (2016/s60/64). However, the thrust block component of the project was not included in the project approval. Therefore, two further approvals are required: a S4.55 (1A) modification under the *Environment and Planning Act 1979* (NSW) (EPA Act) and a S65A modification under the *Heritage Act 1977* (NSW) (Heritage Act).

GML Heritage Pty Ltd (GML) has been engaged to prepare an archaeological assessment and excavation methodology to mitigate any impacts arising from the work, in support of the two applications. The area subject to assessment is located to the immediate south of the Sydney Opera House Monumental Steps, and encompasses an area approximately 6m (east to west) by 8m (north to south) (see Figure 1.1).

1.1.1 Understanding the Project

Sydney Opera House has provided project designs that detail the proposed works; a schematic of the thrust block is shown in Figures 5.1 and 5.2. The work has the potential to impact historical archaeological features and/or deposits within the works zone.

1.2 Heritage Background for the Current Assessment

The background for assessing the archaeological potential and connected values of the specific location of the thrust block location is based on reporting in:

- SOH Conservation Management Plan (CMP) (*Respecting the Vision, Sydney Opera House—A Conservation Management Plan*, fourth edition, Alan Croker);[1]
- the historical archaeological management plan (Godden Mackay Logan [now GML] 2010, Sydney Opera House: Vehicle and Pedestrian Safety Project (VAPS) and Forecourt—Archaeological Management Plan and Archaeological Impact Assessment, prepared for SOH);[2] and
- the outcomes of our archaeological excavations for the VAPS (GML 2016, Sydney Opera House Bennelong Stormwater Channel Diversion and VAPS Project—Historical Archaeological Excavation Report, prepared for SOH).[3]

These documents have been used as the basis for the location specific assessment presented in this document.

1 Croker, A, *Respecting the Vision: Sydney Opera House—A Conservation Management Plan*, report prepared for Sydney Opera House Truct, July 2017.

2 Godden Mackay Logan, Sydney Opera House: Vehicle and Pedestrian Safety Project and Forecourt—Archaeological Management Plan and Archaeological Impact Assessment, report prepared for the Sydney Opera House Trust, February 2010.

3 GML Heritage, Sydney Opera House Bennelong Stormwater Channel Diversion and VAPS Project—Historical Archaeological Excavation Report, report prepared for the Sydney Opera House Trust, January 2016.

1.2.1 Sydney Opera House Conservation Management Plan

The 2017 CMP presents a basic overview of archaeology and a single policy for the management of archaeology. Archaeology is acknowledged as being present through and across the site; reference is made to an overlay of historical plans which provide an indication of potential former structures (2017, Figure 4.5.10). NB: this is not an archaeological zoning plan and does not assess the integrity or potential of archaeology. The heritage significance assessment does not include archaeology.

The CMP requires that all archaeology, both above and below water level, should be managed in accordance with Section 4.20.6:

> *With the history of excavation and major construction on the site, and the low-lying rocky nature of the original peninsula, the likelihood of finding material evidence relating to pre-European use and occupation of the site is considered to be limited. However, any surviving material evidence of Aboriginal occupation of the site, including Bennelong's Hut, would be of significance and add to the overall Indigenous cultural heritage values of the site. Any research or archaeological finds resulting from excavation or other disturbance on the site could provide invaluable material for understanding the evolution and occupation of the site, and should be appropriately interpreted to the public.*
>
> *Parts of the original Fort Macquarie walls, constructed c.1817-1821, are the earliest known surviving structures on the site. Although substantially demolished for the tram depot, some sections remain below the Podium and may extend to other areas. Sections of later seawalls and remains of wharves and jetties are also known to exist.*
>
> *The Bennelong Drain, constructed in the 1850s, originally traversed the site but was diverted and encased in concrete during construction work in the 1960s, '70s and '80s. It was diverted again in 2011 as part of the construction of a new underground loading dock under the Forecourt, but remnants of the original drain remain to the south of the Opera House site.*
>
> *The remains of a crude pit for burning shells for building lime was located on the eastern foreshore during the Vehicle Access and Pedestrian Safety Project and has been interpreted in a short film.*
>
> *The location of archaeological features and material already found on the site to date should serve as a guide for future work.*[4]

Policy 20.10—Archaeology states:

> *Work involving excavation or investigation of sub-surface objects must be planned and executed in accordance with the requirements of relevant legislation regarding archaeology. This includes:*
>
> - *Assessments of the likely archaeological impact of any proposed excavation works by a qualified archaeologist during the planning stages so that any mitigation procedures are handled in a planned and timely manner.*
> - *Disturbance or removal of archaeological material, including unexpected finds, carried out under the guidance of a qualified archaeologist.*
>
> *Sydney Opera House is responsible for the proper engagement of archaeological expertise and for commissioning post excavation analysis. It is also responsible for the conservation, storage and interpretation of archaeological findings and collections.*

Under Policy 18.24 (collections management), all archaeological relics are to be included under the 'Collections Management Policy', which details the strategy to monitor, maintain and manage the collections.

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[4] Croker, A, *Respecting the Vision: Sydney Opera House—A Conservation Management Plan*, report prepared for Sydney Opera House Trust, pp 225–226.

1.2.2 GML 2010

An archaeology management plan and archaeological impact assessment was prepared by GML (2010) for the Vehicle and Pedestrian Safety Project (VAPS). The report provided a holistic assessment of archaeological potential across most of the Sydney Opera House site. The VAPS area of analysis included only a small portion of the current study area. Analysis and reporting presented herein is consistent with GML 2010 and provides a continuation of archaeological assessment and management for the Sydney Opera House.

1.2.3 GML 2016

Between 2011 and 2014, archaeological monitoring, recording and open area excavation (Figure 1.1) in conjunction with the redevelopment of the Sydney Opera House forecourt VAPS identified features and deposits including:

- evidence of the 1902 Tram Shed and small waiting room building on the eastern shore of the boat harbour/slip;
- intact sections of the historic Bennelong Stormwater Channel that was constructed in 1857;
- evidence of the boat harbour/slip established on the southeastern section of Bennelong Point by 1845;
- several seawalls from various phases of the site development (ie the 1864 esplanade wall and c1901 seawall) and associated land reclamation;
- stone footings that could be associated with Fort Macquarie's eastern buttress wall;
- evidence of early lime burning activities on the eastern shoreline—manifested by the remains of a large burning heap and a retaining wall supporting deposits of shell and sand; and
- various cuts, chiselling and drill marks in the bedrock evidencing early stone quarrying.

Consequential analysis identified that the remains associated with the early use of the site, including stone quarrying and evidence of lime production, had high archaeological significance and research value for their ability to contribute to our understanding of the historical evolution of Bennelong Point and the city of Sydney.

The VAPS project archaeological discoveries provide an insight into changing configuration of the land that is most closely associated with the first settlement of Australia by the First Fleet in 1788. Archaeological evidence of the exposed shoreline and associated walls contributes to our understanding of the landforms that existed around Sydney Cove in the first days of the settlement and how it was utilised in the nineteenth century. The results of the archaeological excavations provide tangible evidence of the evolution of Sydney Harbour and the nineteenth and twentieth-century evolution of the city of Sydney.

It is key to note that the archaeological zoning (GML 2010, Figure 2.12), based on historical plans, did not contextualise the extent of historical archaeology consequentially identified (GML 2016).

1.3 Aboriginal Heritage and Archaeology

GML 2010[5] detailed the outcomes of Aboriginal heritage assessment and consultation with the Metropolitan Local Aboriginal Land Council. The outcome was an understanding that works in this specific area do not require an Aboriginal heritage impact assessment or statutory approval through an Aboriginal Heritage Impact Permit (AHIP), under Section 90 of the *National Parks and Wildlife Act 1974* (NSW) (NPW Act).

This historical archaeological report does not provide assessment or management for Aboriginal heritage. Should Aboriginal objects be identified during works, then the works must cease, and an AHIP should be sought to allow harm to the object(s).

1.4 Structure of this Report

This report presents the following content:

- Section 2—an update of the 2010 historical archaeological background.
- Section 3—an archaeological assessment for the thrust block work site.
- Section 4—a heritage significance assessment.
- Section 5—an archaeological impact statement.
- Section 6—the archaeological excavation methodology (research design) to manage and mitigate the impact from the works. This would include details of the type of archaeology that could be removed, and types of archaeology which would need to be retained in situ, and the methodology for undertaking archaeological excavation (mitigation).

1.5 Authorship

This report was prepared by Dr Tim Owen (Senior Associate), with review and advice provided by Abi Cryerhall (Senior Associate). Figures were prepared by Suzy Pickles (Graphics Consultant).

[5] Godden Mackay Logan, Sydney Opera House: Vehicle and Pedestrian Safety Project and Forecourt—Aboriginal Cultural Values Assessment, report prepared for the Sydney Opera House Trust, June 2010.

Figure 1.1 Sydney Opera House and the works zone, where the thrust block will be installed. The location of archaeological excavations (GML 2016) is shown. (Source: Google Earth Pro, 2018, with GML additions)

2.0 Historical Background

2.1 Historical Summary

2.1.1 Bennelong Point

Bennelong Point's history has been the subject of numerous reports and publications. This section builds on GML 2010, which was underpinned by the endorsed *Sydney Opera House—A Revised Plan for the Conservation of the Sydney Opera House and its Site* (third edition) by James Semple Kerr. A detailed analysis of historical plans of the study area has been presented to underpin the analysis. The site's layered history can be contextualised into the following periods of land use:

- Phase 1: 1788–1795—The earliest period of colonial settlement in Sydney Cove, when Bennelong Point was the location of Bennelong's brick hut and, a short while later, a saltworks and windmill.
- Phase 2: 1788–1802—A period of anxiety for the early settlers when the defensive value of Bennelong Point was realised through the construction of a redoubt (1789), later falling out of use, to be replaced with a 'half moon' battery (1798).
- Phase 3: 1810–1843—Work commenced on the construction of a fort at the northern tip of the peninsula (Fort Macquarie) in 1817, while large parts of the rest of Bennelong Point and the surrounding area were reserved for parks and public space (Figures 2.1 and 2.2).
- Phase 4: 1817–1901—A period in which Fort Macquarie's Gothic towers dominated the area, notwithstanding its flaws as a defensive facility. The fort was augmented with new gun batteries in the 1860s and at this time an esplanade was built around the fort by creating an encircling seawall, and steam ferries began operating from points along the shore. In the late nineteenth century, the eastern side of Sydney Cove (the western shore of Bennelong Point) was converted for use by trading companies for major longshore wool, mail and passenger wharves. In the 1890s the western rampart of the fort was demolished to make way for facilities associated with the P&O operation that dominated the western shore (Figures 2.2 to 2.8).
- Phase 5: 1901–1958—The early twentieth century saw Bennelong Point accommodate a number of jetties for use by the public, serviced by a tramline to a new 'tram-car house' which came to be known as 'the shed' in spite of its Neo-Gothic design. The shed was built on the site of Fort Macquarie and was large enough to house 72 trams on 12 parallel tracks. The shed became redundant in the 1950s (Figure 2.8).
- Phase 6: 1955–present—This period saw the conception of Sydney Opera House, which was completed over the next two decades amid ongoing controversy and opened in 1973 (Figures 2.9 to 2.11).

2.2 Site Formation and Disturbance

The potential for archaeological features, deposits and relics to survive at the site depends on the nature of activities undertaken there over the years (the phases of development). Some activities have the potential to disturb or destroy relics, while others (such as introducing or removing fill deposits) can enhance or reduce the chances of archaeological relics surviving.

On the basis of the many activities that have taken place on the site in the twentieth century, the New South Wales State Heritage Register (SHR) citation states:

> *After the profound building effort required to construct the Sydney Opera House, it is unlikely that any archaeological potential is retained in relation to its historical associations with famous people and important themes in Australian history.*[6]

However, excavations beneath Sydney Opera House in the early 1990s, minor excavations for a lift well in 2004 and the extensive excavations for the VAPS project in 2011–2014 have exposed significant archaeological evidence at a relatively shallow depth, suggesting that levels of disturbance in parts of the site might be lower than expected. Major episodes (or areas) of modification or potential disturbance are discussed below.

2.2.1 Land Reclamation

Bennelong Point was used throughout the nineteenth and twentieth centuries for a variety of purposes, including reclamation of the shorelines and modification of the landform that changed the shape and character of the area throughout its history.

By 1829, parts of the shoreline of Bennelong Point had been modified and reclaimed (Figure 2.1). This process continued over the next century, with various phases of seawall and wharf construction. The shoreline along the southeastern section of the peninsula was the first section to be reclaimed (by 1829) and a boat slip had been created in this area by 1845 (Figure 2.2).

In 1861, an esplanade was created around Fort Macquarie by erecting an encircling seawall and filling the area formerly covered by high tides. The western shore was used from the 1860s (but mainly from the 1880s) for wharves, jetties and wharf buildings (Figures 2.3 and 2.4). In the late nineteenth century, earlier wharf buildings were demolished and then replaced with larger wharf facilities by P&O. (The expanded P&O facilities were demolished as part of the Sydney Opera House development.)

The present shorelines of Bennelong Point, which are contained by seawalls, represent entirely reclaimed land. Episodes of reclamation of the shorelines of Bennelong Point throughout the nineteenth and twentieth centuries would have been unlikely to have caused any major disturbance to archaeologically sensitive deposits. In some cases (eg the area excavated for the VAPS project, GML 2016) historical ground levels, original shorelines and remains of other features were sealed beneath introduced fill deposits, thereby providing some protection for the survival of such remains.

2.2.2 Modification to Ground Levels

The physical development of Bennelong Point over the nineteenth and twentieth centuries has also affected the ground levels of the peninsula. A photograph taken in the late 1850s shows the top of the Bennelong stormwater channel exposed along the western side of Fort Macquarie (see Figure 2.12). The top of the channel protrudes just above the surrounding ground surface in this image, which gives an indication of the mid nineteenth-century ground levels in relation to the channel. It is understood that this section of the channel was decommissioned as part of the Sydney Opera House construction. The extent of impact of the construction of the 1901 tramcar house on the original channel is unknown. On the basis of this 1850s photograph and the 2011 archaeological excavation (Figure 2.13) it has been

6 Office of Environment and Heritage, State Heritage Inventory, 'Sydney Opera House', 01685, viewed 15 May 2018 <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5054880>.

confirmed that this section of channel is located approximately 2m below the current ground (forecourt) surface. It can be stated that the forecourt has been built up by approximately 2m since the 1850s.

The most significant modifications to ground levels across Bennelong Point were most likely in association with construction of the tram house and associated track infrastructure in the early twentieth century (Figures 2.8 to 2.10), as well as the construction of Sydney Opera House in the 1960s to 1970s (Figures 2.11, 2.14 and 2.15).

Modifications to ground levels throughout the history of Bennelong Point have largely involved the introduction of fill deposits and reclamation of shorelines. On this basis, these episodes of modification would have been unlikely to have caused any major disturbance to archaeologically sensitive deposits and has sealed historical ground levels across the forecourt area.

2.2.3 Sydney Opera House Construction

Construction of Sydney Opera House in the 1960s to 1970s (Figures 2.11, 2.14 and 2.15) had a dramatic impact on the physical form of Bennelong Point, including:

- modification of the shape of Bennelong Point with the construction (and some replacement) of seawalls around the entire shoreline;
- regularisation of ground levels through the introduction of fill deposits to create a level forecourt and boardwalk platforms;
- excavation for the construction of basement levels and other structural elements of Sydney Opera House itself; and
- construction of other infrastructure associated with Sydney Opera House and its operation.

The construction of Sydney Opera House would therefore have resulted in major impacts on archaeologically sensitive deposits beneath the footprint of Sydney Opera House, particularly in the basement and sub-basement areas. However, excavation for a lift shaft in 2004 revealed the presence of some substantial sandstone structural remains beneath the building, most likely associated with Fort Macquarie. Information recorded during the 2004 works indicates that the structural remains were located within the existing basement level of Sydney Opera House (that is, between levels RL+3.658 and RL-0.305 [AHD] [+12’ and -1’]). This evidence indicates that while major disturbance is likely to have occurred across much of the site, there are areas beneath Sydney Opera House that still retain archaeological potential.

Further, the construction of Sydney Opera House is likely to have had a relatively minor impact on any archaeologically sensitive deposits within the forecourt area. This was clearly evidenced through the 2011–2014 archaeological excavations (GML 2016). Photographs taken in the 1960s to 1970s, which show the construction of Sydney Opera House in progress, do not indicate any specific episodes or areas of major disturbance or excavation within the forecourt area, notably including the current study area (Figures 2.14 to 2.15).

Evidence of the tram tracks has been exposed at relatively shallow levels on Bennelong Point, indicating that excavation work associated with the construction of Sydney Opera House had only a limited impact on these relics in at least some places.

2.2.4 VAPS Works

The forecourt area contains several underground services including conduits, access pits and other infrastructure associated with electricity, water, telecommunications and sewerage. Construction during the VAPS project installed services to the immediate east and south of the Monumental Steps, through the current study area (Figures 2.16 and 2.17).

This work involved excavation to the bedrock (evidence through the geotechnical bore log, Section 2.2.5) in diagonal trenches covering approximately the northeastern half of the study area. Concrete was poured on the bedrock, the services were installed, and the trenches were backfilled with rubble.

The remainder of the study area was stripped to ~0.5m, a concrete slab was poured and a granite surface installed (Figure 2.17).

This work would have removed all archaeological potential from the area with services (Figure 2.16), which is approximately half the study area.

2.2.5 Geotechnical Analysis

Douglas Partners[7] undertook three bore holes within the northeast corner of the study area—BH 302, 302A and 302B; 302 and 302A were discontinued at depths of 0.84m and 1.05m respectively, due to services and an unexpected concrete slab.[8] Bore log 302B,[9] located within the zone of service installation, presents the following stratigraphy:

- pavers—to 0.08m depth, underlain by;
- concrete—150mm thick, underlain by;
- filling—cement stabilised roadbase and gravel and concrete cobble filling, of up to 150mm diameter, including a 5mm reinforced bar to 1.0m depth, underlain by;
- concrete—1.15m depth, underlain by;
- sandstone—high strength, moderately weathered to fresh, slightly fractured and unbroken brown and light grey sandstone, with some siltstone clasts from 5.6m to 5.8m.

The 302B bore log provides evidence for sandstone bedrock at a depth of 1.15m, overlain by non-archaeological fills.[10] Bedrock was estimated to be present from 1.15m to 1.5m across the study area. This presents a stark difference in bedrock depth and overlying fill when contrasted against the depth of fill and land reclamation, identified in connection with the Bennelong stormwater channel.

7 Douglas Partners, Proposed Upgrade & Refurbishment – Lift 36 and Thrust Block, Sydney Opera House, Bennelong Point, prepared for Sydney Opera House, February 2017.

8 Douglas Partners, Proposed Upgrade & Refurbishment – Lift 36 and Thrust Block, Sydney Opera House, Bennelong Point, prepared for Sydney Opera House, February 2017, p 3.

9 Douglas Partners, Proposed Upgrade & Refurbishment – Lift 36 and Thrust Block, Sydney Opera House, Bennelong Point, prepared for Sydney Opera House, February 2017, p 4.

10 Douglas Partners, Proposed Upgrade & Refurbishment – Lift 36 and Thrust Block, Sydney Opera House, Bennelong Point, prepared for Sydney Opera House, February 2017, p 7.

2.3 Summary of Site Formation and Disturbance

The process of land reclamation, development and consequent demolition, filling and construction of the Sydney Opera House is likely to have conserved historical archaeological features within the study area. However, the VAPS works have removed any deposit capable of containing archaeological features from at least 50 per cent of the study area. It is clear that the northeastern portion of the study area has been entirely disturbed.

In this location, bedrock is found at a depth of 1.15m from the current surface. The granite pavers are set on a concrete fill and other modern fills to a depth of 0.55m from the surface. Therefore, approximately half of the study area—the southwestern portion, between a depth of 0.55m and 1.15m—contains soil deposits which may retain their integrity for archaeological deposits. The extent of the area with potential for archaeological integrity covers ~27m^2.

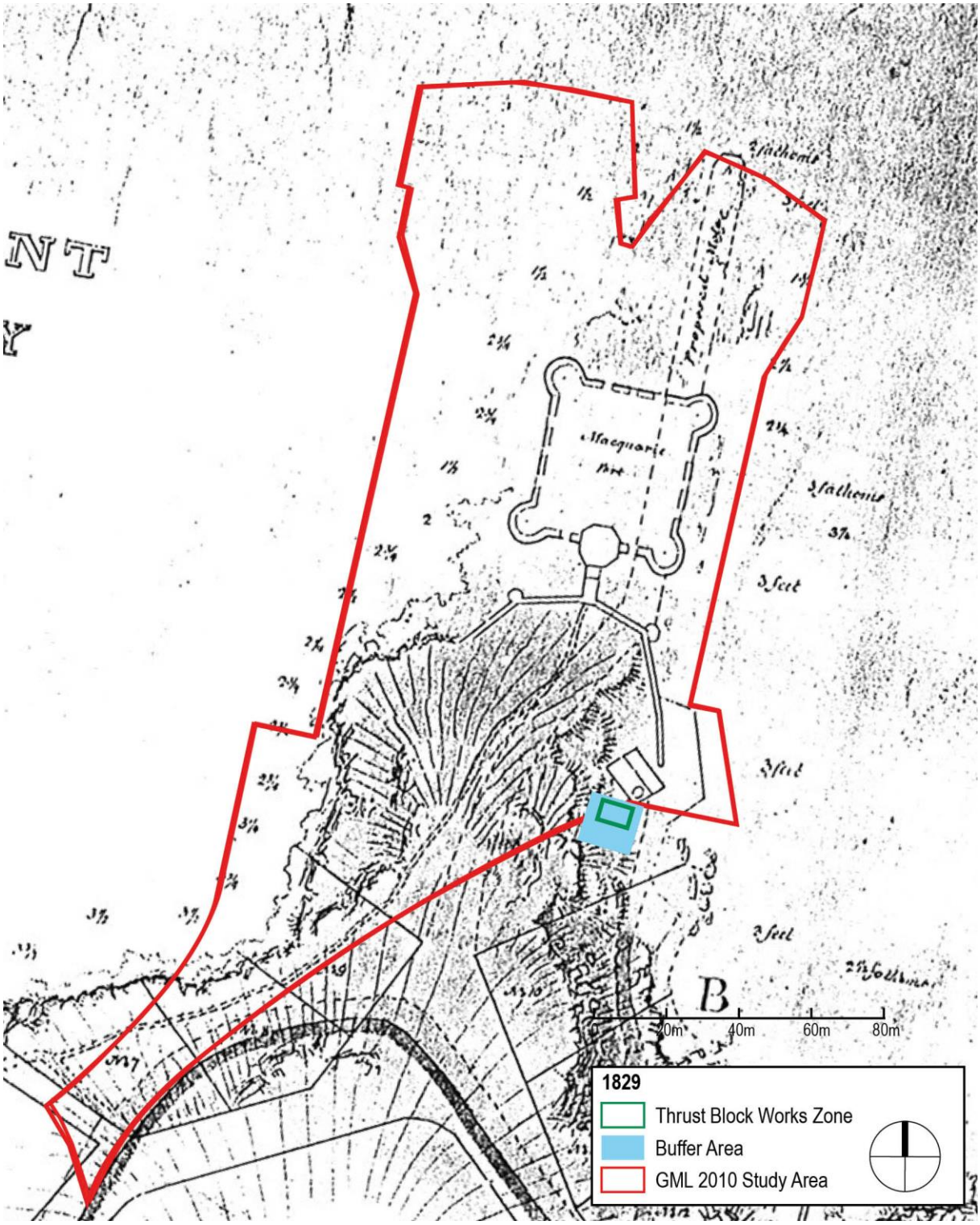

Figure 2.1 Extract of 1829 plan showing the Sydney Domain between Sydney Cove and Farm Cove. Note the southeastern extension of Fort Macquarie, as well as a rectangular structure near the eastern shoreline. The study area is outlined. (Source: SRNSW, AO Map SZ454 [SG Map S.627], Surveyor: White and Larmer)

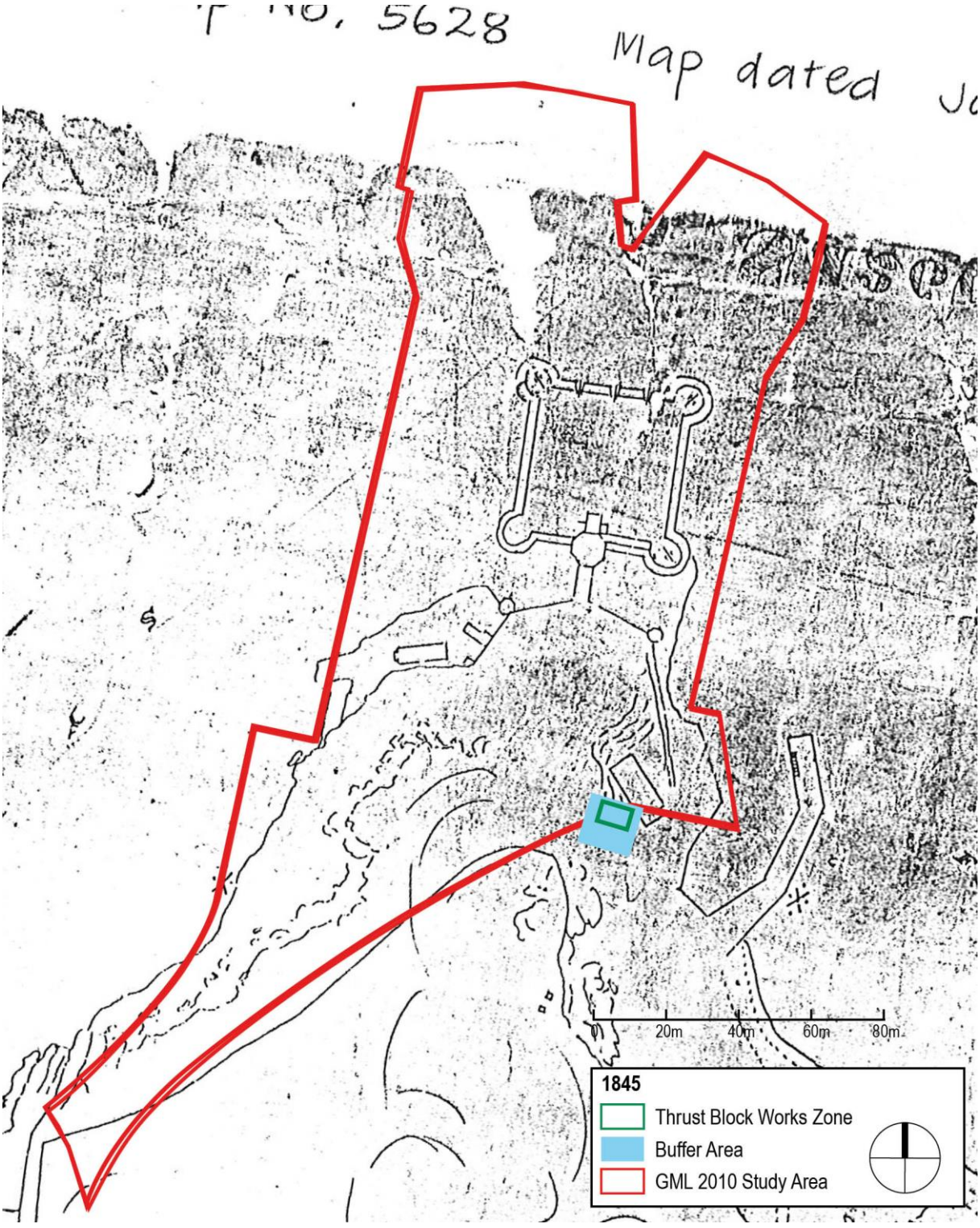

Figure 2.2 Extract of 1845 plan of Bennelong Point. Note the southeastern extension of Fort Macquarie, as well as a rectangular structure near the eastern shoreline. The boat harbour/slip on the eastern shore had been constructed by this time. The study area is outlined. (Source: SR Item Map No. 5628)

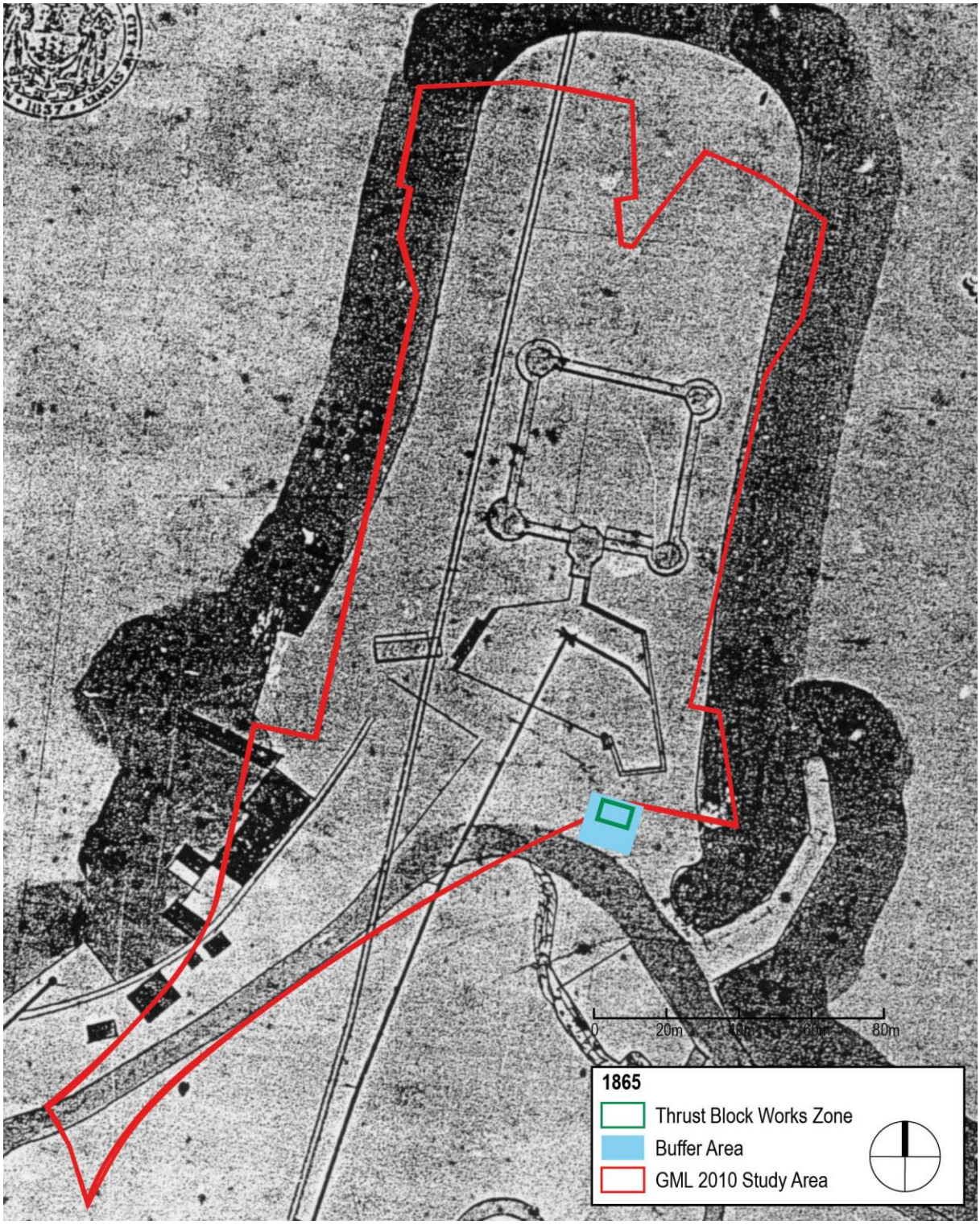

Figure 2.3 Extract of the 1865 Trigonometrical Survey of Sydney showing Bennelong Point. Note the southeastern extension of Fort Macquarie, the boat harbour/slip on the eastern shore and wharf facilities along the western shore. The rectangular structure near the eastern shoreline shown on earlier plans had been demolished by this time. The study area is outlined. (Source: SRNSW, NRS 9929)

Figure 2.4 Extract of c1887 plan of Bennelong Point showing the southeastern extension of Fort Macquarie, the boat harbour and wharf facilities along the western shore. The study area is outlined. (Source: SRNSW, AO Map No. 608)

Figure 2.5 1890 'Plan of the Site of Proposed Drill Shed &c at Fort Macquarie', showing detail of the southern extension of Fort Macquarie. The study area is outlined. (Source: SRNSW, AO Plan No. 1306)

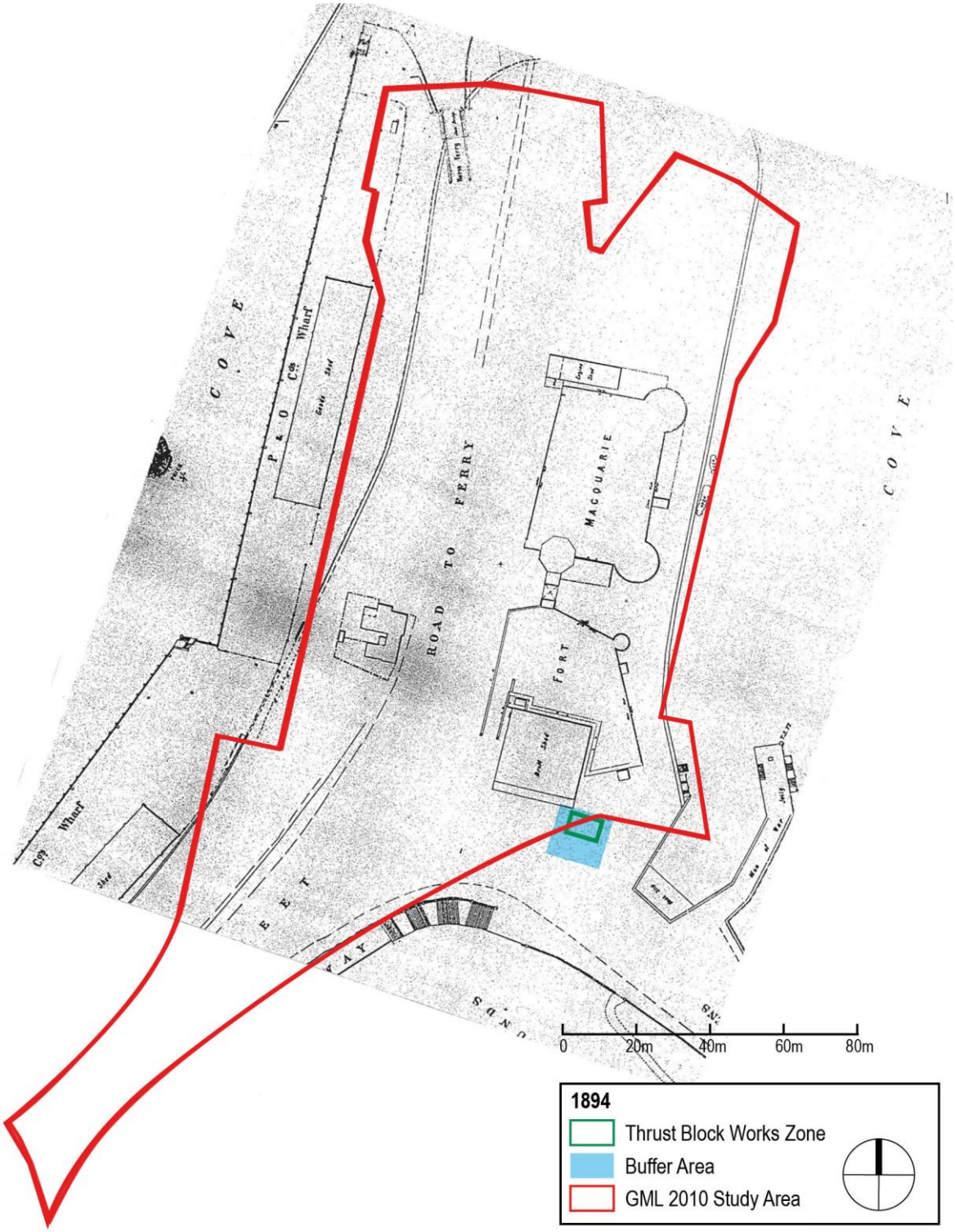

Figure 2.6 1894 plan of Fort Macquarie and Bennelong Point showing the southeastern extension of Fort Macquarie, the boat harbour and wharf facilities along the western shore. The naval volunteers drill shed has been constructed. The study area is outlined. (Source: Metropolitan Detail Survey M Ser 4 811.17/1 Sydney Sheet P4; Australian Archives [NSW] B1905/10192)

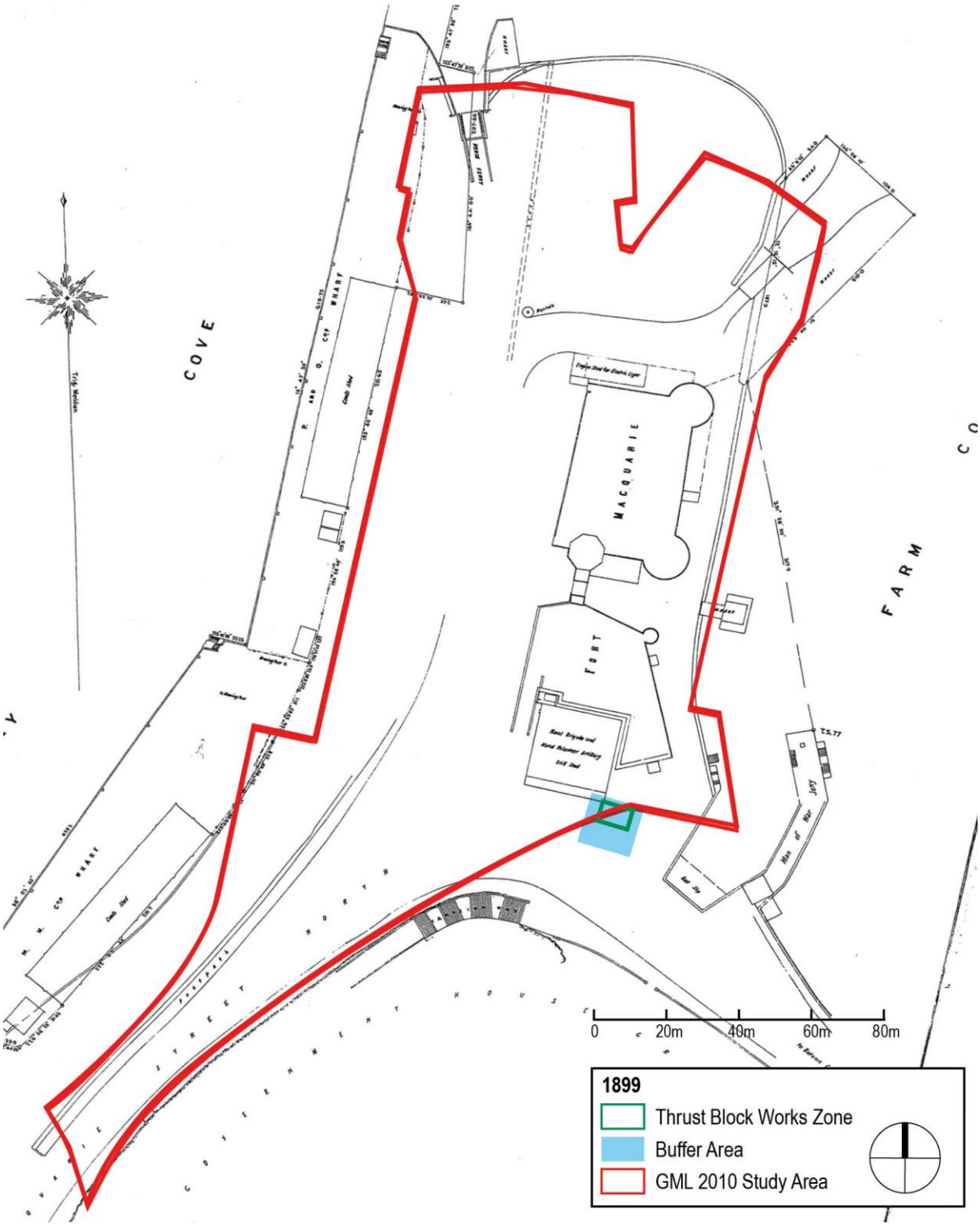

Figure 2.7 Extract of 1899 plan of Bennelong Point showing the southeastern extension of Fort Macquarie, the boat harbour and wharf facilities along the western shore. The study area is outlined. (Source: SRNSW, AO Map No. 521)

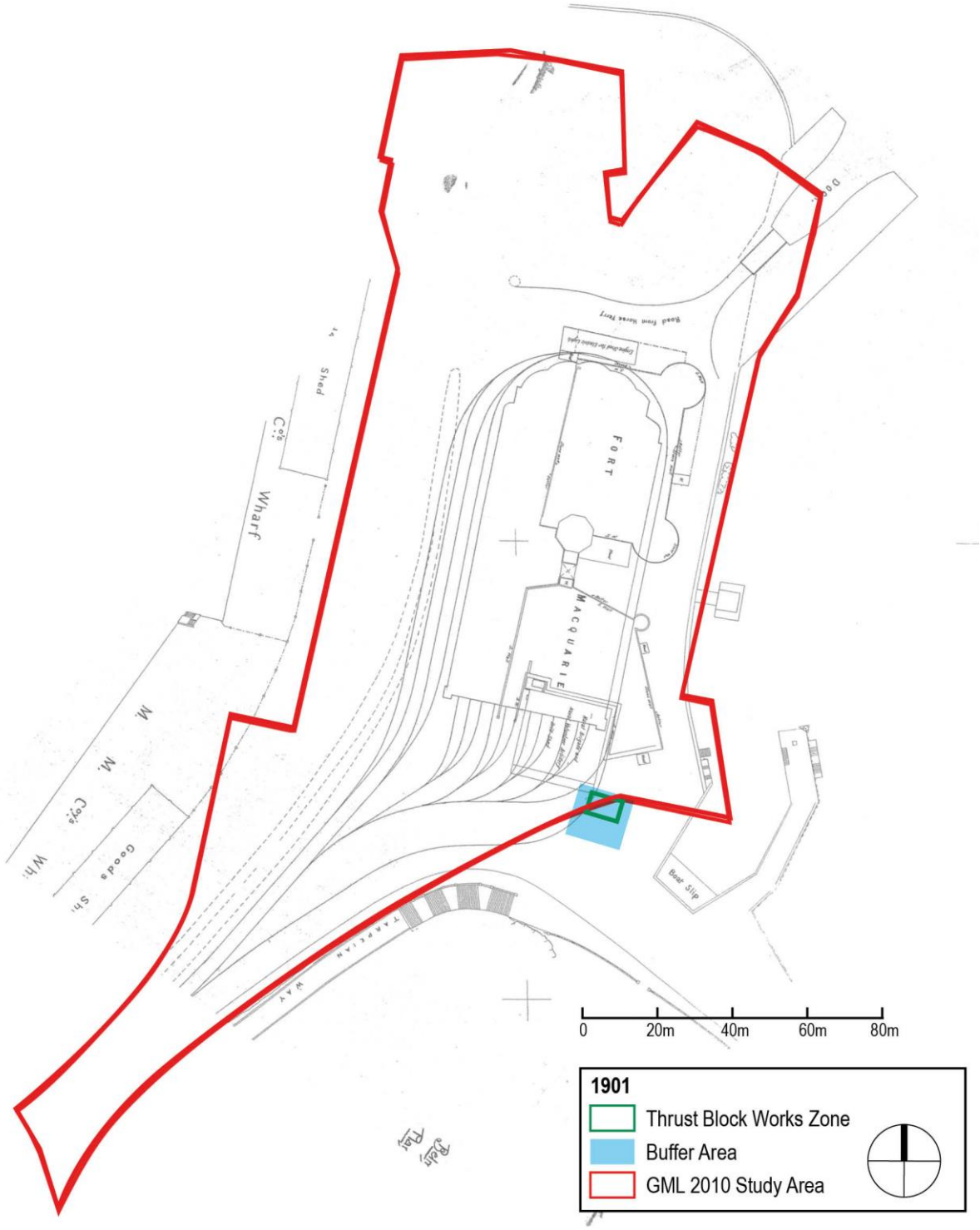

Figure 2.8 Extract of 1901 NSW Government Transport Plan—'Belmore Park to Fort Macquarie Electric Tramway Plan Showing Position of Car House…'. This plan shows the location of Fort Macquarie in relation to the tramcar house and naval drill shed. The study area is outlined. (Source: SRNSW, CGS 12909, SR Plan No. 61078)

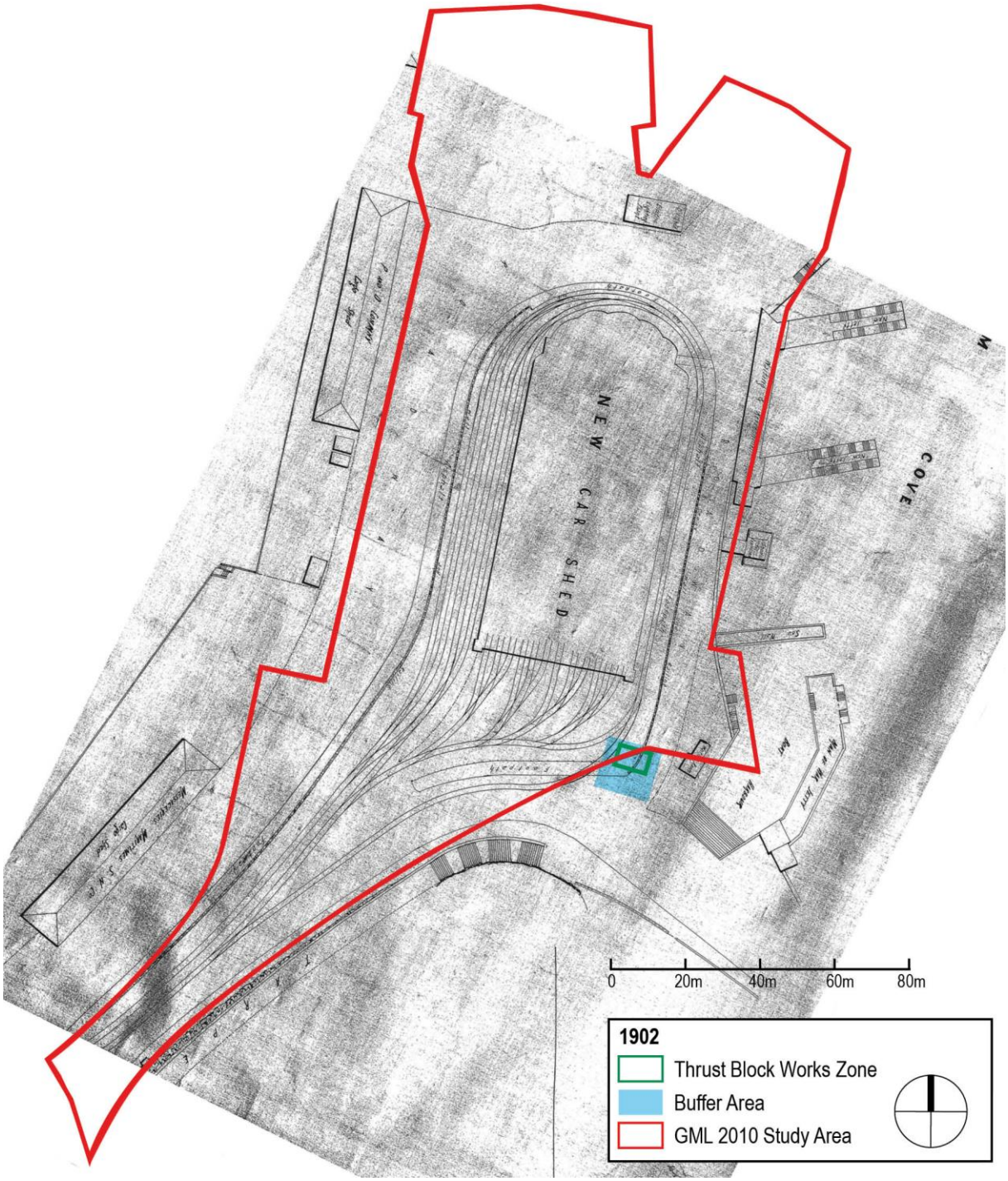

Figure 2.9 Extract of 1902 plan of 'Part of Circular Quay and Fort Macquarie', showing the tramlines and pathways to the south of the tramcar house, as well as a 'waiting room' structure adjacent to the boat harbour/slip. The study area is outlined. (Source: SRNSW, AO Map No. 516)

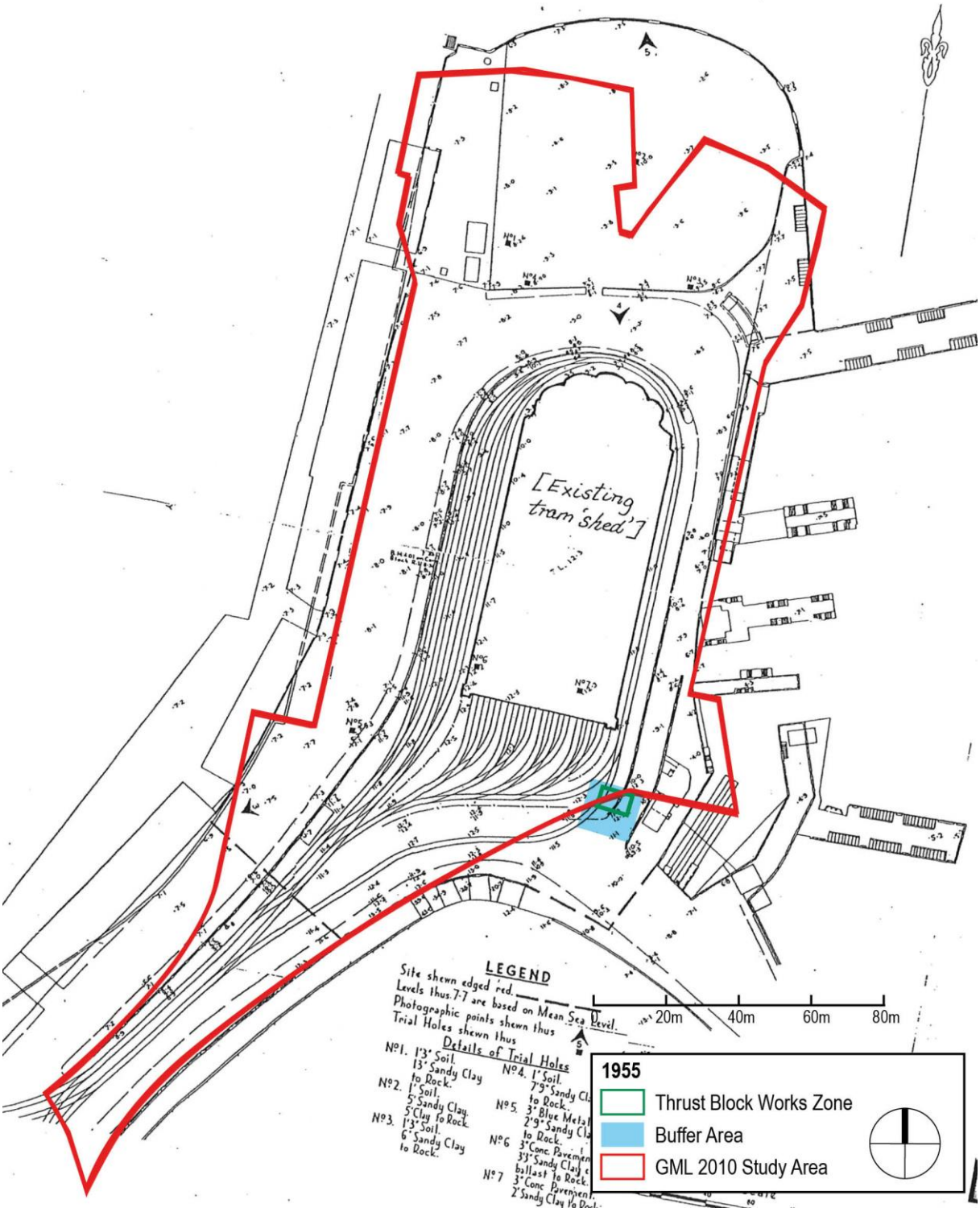

Figure 2.10 1955 plan of Bennelong Point, showing the tramlines and pathways to the south of the tramcar house as well as various structures adjacent to the boat harbour/slip. The study area is outlined. (Source: Reproduced from 2003 Conservation Plan, Figure 12)

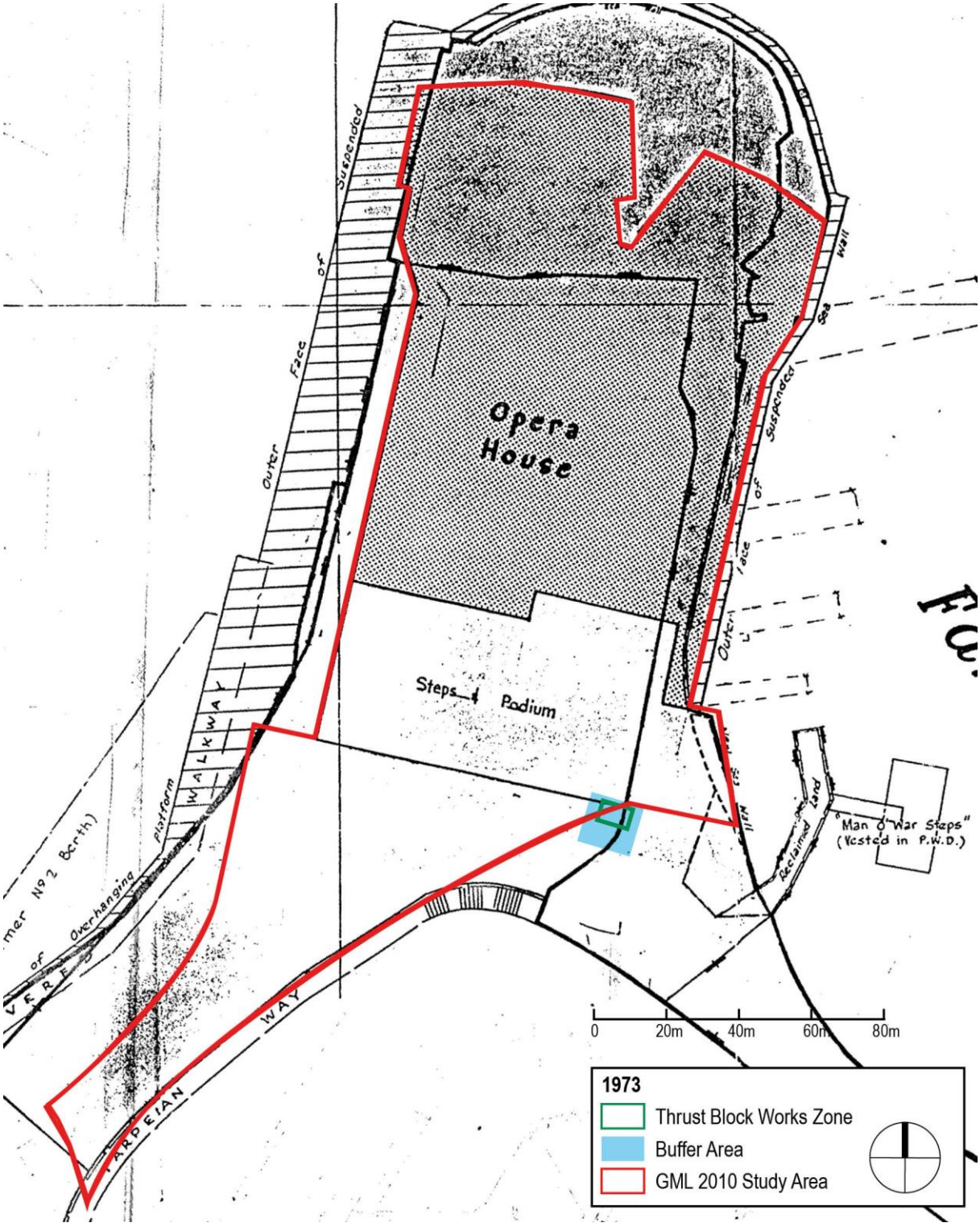

Figure 2.11 c1973 plan of the Sydney Opera House site, indicating the new section of seawall constructed along the eastern shoreline. The study area is outlined. (Source: Sydney Opera House Trust)

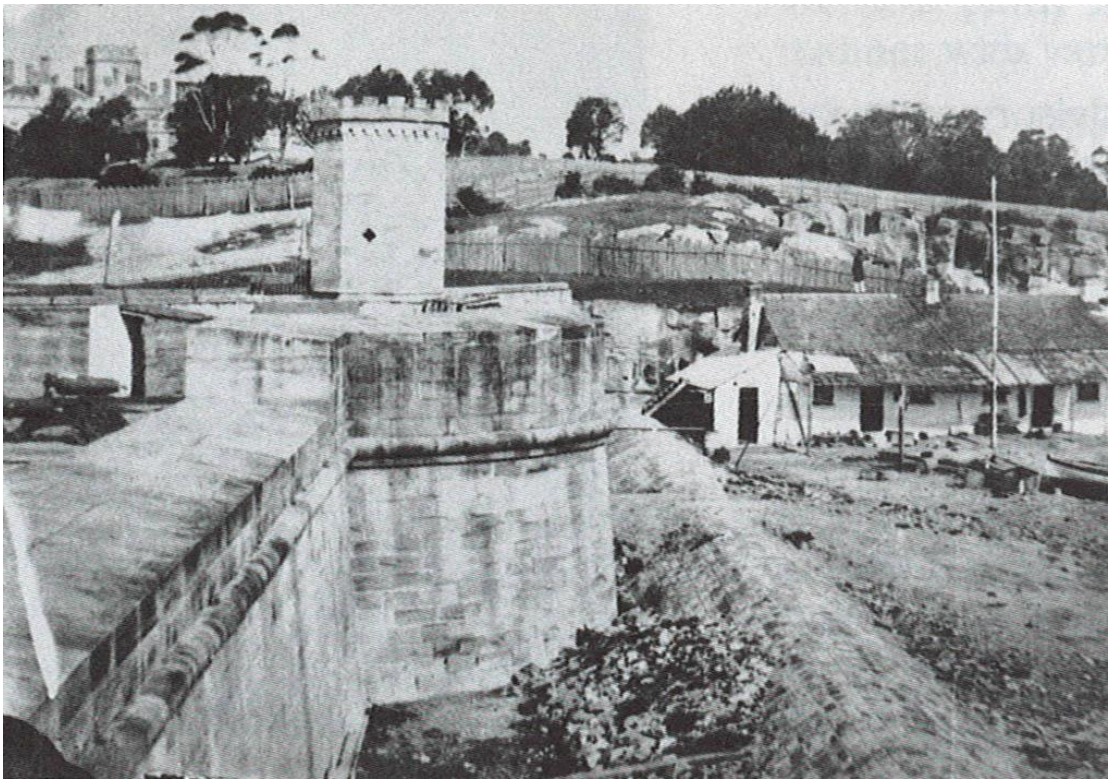

Figure 2.12 Photograph taken in the 1850s showing the top of the original Bennelong stormwater channel (brick oviform drain) running along Bennelong Point adjacent to Fort Macquarie. (Source: Reproduced from the 2003 Conservation Plan, Figure 70, p 94)

Figure 2.13 View looking east showing the size of the service relocation trench that runs across the southern part of the forecourt. This trench is to the south of the current study area. The exposed Bennelong Channel section is visible in the foreground. (Source: GML 2011 in GML 2016, Figure 4.26)

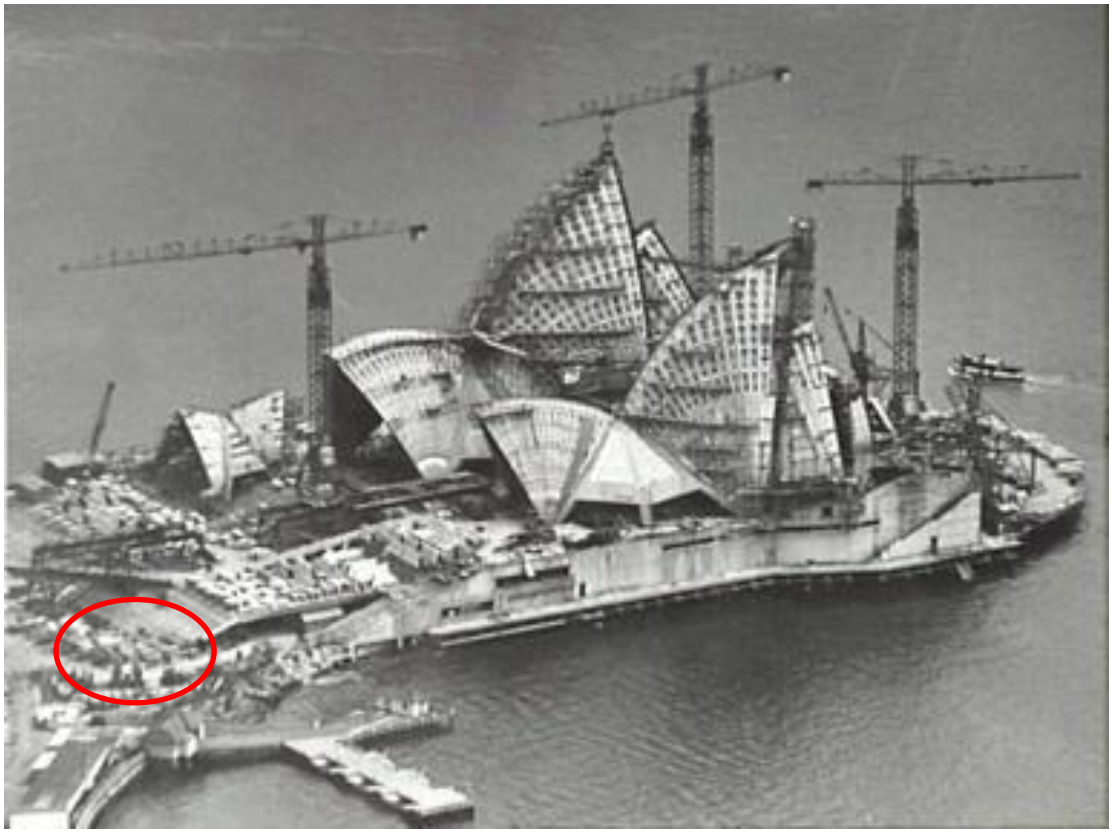

Figure 2.14 Photograph taken in 1966 showing the construction of Sydney Opera House in progress. The study area is outlined in red. (Source: SLNSW, Frame No. Australian Photographic Agency—22157)

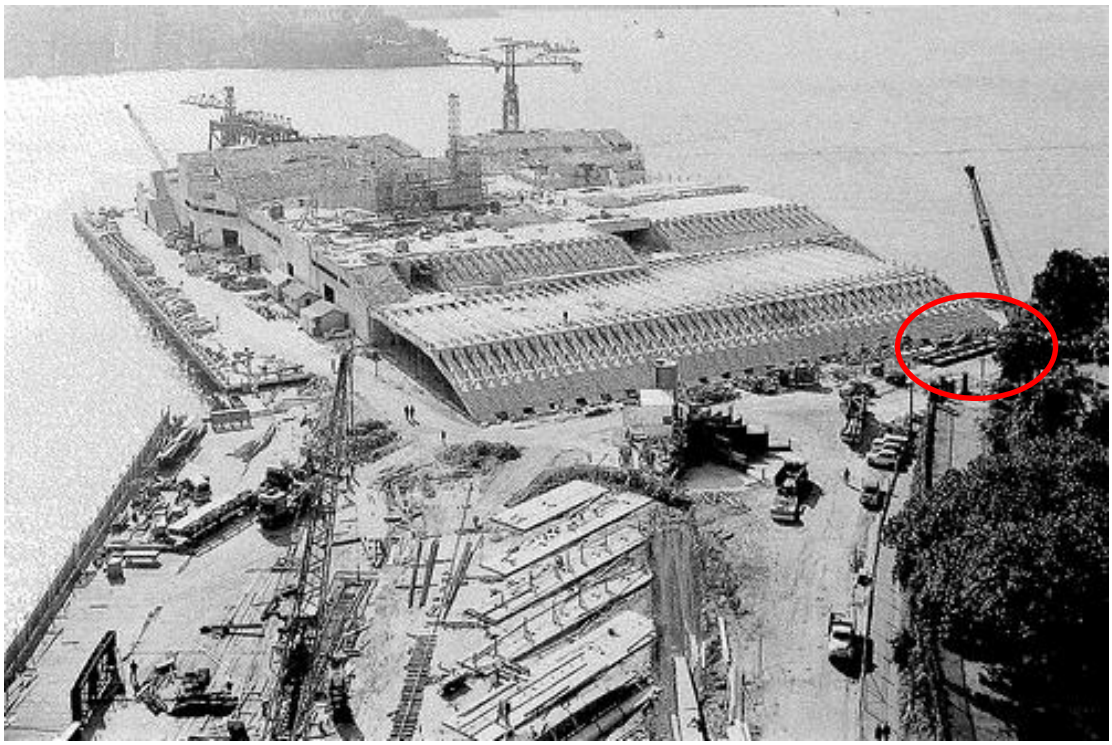

Figure 2.15 Photograph taken in 1963 showing the construction of Sydney Opera House in progress. The study area is outlined in red. (Source: SLNSW, Frame No. GPO 2—23027)

Figure 2.16 Photographs of 2014 excavation and service installation during the VAPS project. The service trenches were excavated to bedrock. (Source: Sydney Opera House)

Figure 2.17 Photographs of 2014 excavation and service installation during the VAPS project. The remainder of the area was stripped to ~0.5m. (Source: Sydney Opera House)

3.0 Archaeological Assessment of Potential and Integrity

3.1 Assessment of Archaeological Potential

Historical plans document the primary process of land reclamation and physical development of Bennelong Point throughout the nineteenth and twentieth centuries (Figures 2.1 to 2.11). Analysis of these plans provides an understanding of how the study area was used during this time, and enables an assessment of the nature and extent of physical evidence of these uses that may have survived at the site. These plans have all been overlaid with modern plans to determine which areas and historical features were located within the study area and therefore would be relevant to this assessment (Figure 3.1). Given the general inaccuracy of historical plans, the wider Sydney Opera House site has been mapped, so the context of adjacent features and buildings may be understood.

On the basis of the documented historical development of Bennelong Point and episodes of modification and disturbance that have occurred throughout its history, the historical archaeological potential of the study area is outlined in the table below. Site formation events and former buildings documented within c10–15m of the study area could be present within the study area, and have been included in this assessment. Three former buildings could be associated with the study area:

- Fort Macquarie—the southeastern portion of the external walls could extend into the study area. Analysis of historical plans suggests this building was located 10m north of the study area. The presence of this building within the study area is therefore considered unlikely (Figures 2.1 to 2.8).
- The early rectangular building (c1829 to c1845)—analysis suggests this building abuts or possibly extends into the study area (Figures 2.1 to 2.2).
- The naval drill hall (c1890 to c1901)—analysis suggests this building abuts or possibly extends into the study area (Figures 2.5 to 2.8).

The table has been structured as follows:

- ‘Phase’ denotes the phase of historical development (identified in Section 2.1.1);
- ‘Site Features’ indicates features (or activities) shown on historical plans or that may be present as a result of usual site formation processes (eg accumulation of deposits);
- ‘Date’ indicates either the date range of the historical phase that the features or activities are related to, or a particular period of time when that feature or activity was known to be present or occur;
- ‘Potential Remains’ describes the types of evidence associated with the feature or activity that may survive at the site; and
- ‘Likelihood of Survival’ indicates the likelihood that the potential remains would survive intact and/or in situ—this analysis is based on the understanding of integrity (Section 2.3).

Table 3.1 Analysis of Archaeological Potential Associated with the Study Area.

Phase	Site Features	Date	Potential Remains	Likelihood of Survival
—	Aboriginal evidence. (The only recorded site in this area was 'destroyed' prior to 1983.)	Pre 1788–1802	Deposits and features associated with Aboriginal occupation or activities in this area (eg middens, artefact scatters, isolated artefacts).	Very low
1–2	There is no specific development or land use activity recorded within the study area during this period.	1788–1802	Deposits associated with the original shorelines (eastern side of Bennelong Point) and the original landform.	Moderate
			Evidence for the infilling of the original shoreline, with stone rubble filling crevices.	Moderate
			Quarrying cuts and convict drill marks on the bedrock.	Low
1–5	Rubbish dumps into water—later reclaimed land.	1788–1960s	Concentrations of artefacts within areas of reclaimed land beneath introduced fill deposits.	Low
3	Evidence of early lime burning activities on the eastern shoreline.	c1810	Deposits of shell and infrastructure associated with the process.	Low
3	Rectangular structure shown on plan adjacent to eastern shoreline (form/function unknown) (Figures 2.1 and 2.2). **Possibly located within the study area.**	By 1829	Structural remains (probably timber). Cuts in the bedrock associated with the structure.	Low
3–4	Fort Macquarie. **NB unlikely to be positioned within the study area.**	1817–1901	Structural remains (stone, brick, timber) associated with internal and/or external features of or additions to Fort Macquarie.	Very low
			Deposits associated with occupation/use of Fort Macquarie (internal and external).	Low
			Roadways or pathways around Fort Macquarie.	Low
4	Drill hall.	1890s–1901	Structural remains (stone, brick, timber) and associated deposits and features.	Low–moderate
5	Tramcar house and associated infrastructure.	1901–1950s	Structural remains of tramcar house (stone, brick), tram tracks, roads, and footpaths extending from and adjacent to the tramcar house.	Moderate
6	Evidence associated with the construction of Sydney Opera House.	Post-1963	Construction debris and fills.	Moderate

3.2 Summary of Archaeological Potential

The study area has some potential to contain intact archaeological remains associated with various phases of the site's history. The northeastern half of the study area has been subject to total disturbance, while the southwestern half appears to remain some integrity—which would require archaeological verification (Figure 3.1 and 3.2).

Analysis of historical information and other evidence related to the development and modification of Bennelong Point throughout its history indicates that, in general, the forecourt area of Sydney Opera House has remained relatively undisturbed. However, this area has also remained largely undeveloped relative to other parts of Bennelong Point. As a result, the forecourt area is likely to retain evidence for the earliest phase of land reclamation, and later phases when the southern sections of smaller ancillary buildings extended into the zone. The area was also used for minor infrastructure associated with these historical phases, which could survive intact—eg pathways, roadways, and/or tram tracks.

Analysis of prior archaeological excavation indicates that most of the archaeological evidence survives at depths equivalent to the current basement level of Sydney Opera House, that is, between levels +3.66m and -0.30m (+12' and -1') (Figure 3.3). This is analogous with the depth of deposits possibly retained between the study area's surface layers and underlying bedrock (Section 2.2.5).

The likelihood of survival of these remains (ie their archaeological potential) is distinct from their heritage significance or value. Their significance is assessed in Section 4.0.

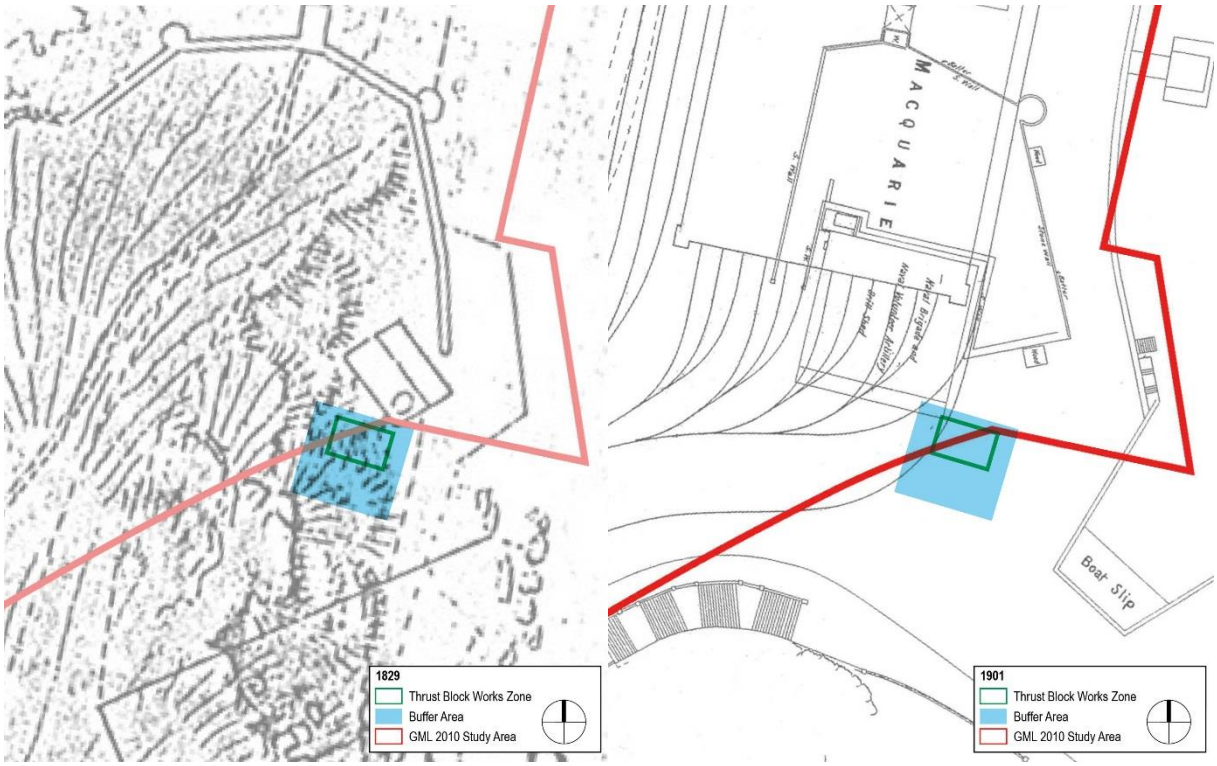

Figure 3.1 Overlays that summarise the historical archaeological potential of the study area, showing the location of potential archaeological remains. (Source: GML 2018)

Figure 3.2 Approximate extent of the study area (red outline), facing SSE. The northeastern portion (grey) has no archaeological potential; the southwestern portion (green) retains integrity and has archaeological potential for the original landforms, processes of land reclamation and later tramcar house infrastructure. (Source: GML)

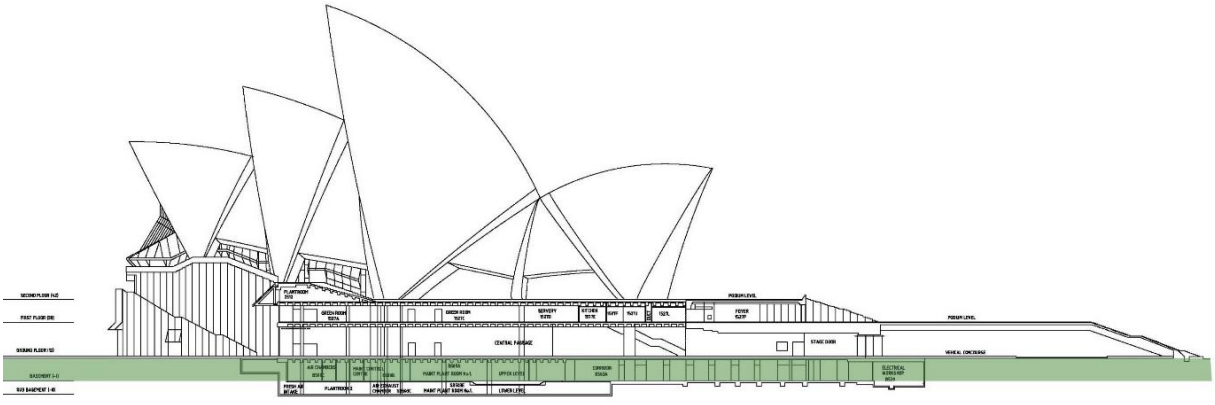

Figure 3.3 Section drawing of Sydney Opera House showing the levels of existing building elements. The majority of the site's potential archaeological remains would be located at depths equivalent to the existing basement level (between +12' and -1'), which is shown here shaded green. (Source: Sydney Opera House Trust)

4.0 Heritage Significance Assessment

The NSW Heritage Council has adopted specific criteria for heritage assessment, related to the Heritage Act (as amended).[11] Seven criteria have been developed based on the Burra Charter (2013)[12] values: historical significance, aesthetic significance, scientific significance and social significance. Archaeological sites (and potential) are frequently considered under criterion E—archaeological research potential. Some aspects of archaeological significance can be associated with individuals, events, groups of historical importance (under criteria A, B and D); aesthetic or technical significance (under criterion C); and their ability to demonstrate the past (under criteria A, C, F and G).[13]

4.1 Assessment of Historical Archaeological Potential

Archaeological significance refers to the heritage significance of known or potential archaeological remains. In NSW, archaeological remains are managed in accordance with their assessed levels of significance in line with *Assessing Significance for Historical Archaeological Sites and 'Relics'*, published by the NSW Heritage Branch (now Heritage Division, OEH) in 2009.

This significance assessment specifically considers the historical archaeological resource of the site.

4.1.1 Assessment of Research Potential—Bickford and Sullivan's Questions

This assessment has confirmed that the study area holds some potential for historical archaeological features and deposits (Table 3.1). However, any deposits need to be contextualised with reference and relevance to the wider site's history, historical themes and specifically the research potential of the deposits.

> *Archaeological research potential is 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'.*[14]

To assess the research potential of the site, three basic questions (commonly referred to as the Bickford and Sullivan questions[15]) are addressed:

1. Can the site contribute knowledge that no other resource can?
2. Can the site contribute knowledge that no other site can?
3. Is this knowledge relevant to general questions about human history or other substantive questions relating to Australian history, or does it contribute to other major research questions?

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11 NSW Heritage Office, *Assessing Heritage Significance*, Sydney, NSW Heritage Office, 2001.

12 Australia ICOMOS Inc, *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance 2013*, Australia ICOMOS Inc, Burwood, VIC, 1–10.

13 NSW Heritage Branch, *Assessing Significance for Historical Archaeological Sites and 'Relics'*, Heritage Branch of the Department of Planning, 2009, Section 4.4.

14 NSW Heritage Branch, *Assessing Significance for Historical Archaeological Sites and 'Relics'*, Heritage Branch of the Department of Planning, 2009, p 11.

15 Bickford, A and Sullivan, S 1984, 'Assessing the Research Significance of Historic Sites', in Sullivan, S and Bowdler, S (eds), *Site Surveys and Significance Assessment in Australian Archaeology,* Proceedings of the 1981 Springwood Conference on Australian Prehistory, Department of Prehistory, Research School of Pacific Studies, Australian National University, Canberra, pp 23–24.

The study area has the potential to contribute unique evidence connected to the early rectangular building and drill hall—these items have not previously been archaeologically identified within the Sydney Opera House site.

The VAPS site provided an opportunity to understand processes of land reclamation, seawall development, early lime production, the mode of construction associated with Fort Macquarie, the Bennelong Stormwater Channel, the boat harbour and slipway and evidence from the tram sheds. Within this context, the current study area could contain ancillary evidence for these processes, which could challenge or confirm the findings of existing knowledge.

Archaeological deposits have the potential to contribute new knowledge unavailable from other resources with respect to the early rectangular building and drill hall. The archaeological resource has the potential to contribute knowledge relating to the mode of construction, the material of construction and possibly some uses associated with each building.

Information regarding the development of Sydney Harbour's shoreline, on the location of the first non-Aboriginal settlement of the country, would further contribute to questions relating to Australia's history including the early settlers' responses to the pre-existing natural environment, the development of the harbour and the defensive uses to which the area was put.

Intact soil deposits from c1788 could contain spores and pollen from vegetation—analysis could further recent research into the reconstruction of flora regimes around the Tank Stream Valley c1788.[16]

The archaeological features and deposits in this small study area could further our understanding of Bennelong Point's history—which is significant in the context of the Sydney Opera House and its World Heritage listing. The principal value would lie in the contribution that they may make to our knowledge of the nature of development of the site itself (Bennelong Point) and the surrounding area.

Further to these basic statements, the Heritage Division has provided guidance on assessment of archaeological potential, linking the potential to heritage value.[17] Relevant to this investigation are the questions associated with research potential, which are used to inform the significance assessment associated with NSW assessment criterion E (refer to the following section).

Archaeological research is required to add knowledge relating to the past, rather than duplicate known information available through other avenues, such as documents, oral records or other similar sites already investigated.[18]

4.1.2 Prior Heritage Assessment

The 2017 CMP does not include any archaeological value in the significance assessment, under World, National or state heritage values.[19] The State Heritage Register, the National Heritage List and World

[16] Macphail, M, Owen, T, and Thorp W, forthcoming, 'The ecology of the lower reaches of the Tank Stream Valley and foreshore in Sydney Cove, NSW, in the late Holocene and point of Colonial settlement, 1788. New plant fossil evidence from 200 George Street, Sydney', manuscript in review by *Australasian Historical Archaeology*.

[17] NSW Heritage Branch, *Assessing Significance for Historical Archaeological Sites and 'Relics'*, Heritage Branch of the Department of Planning, 2009, Section 4.4.

[18] NSW Heritage Branch, *Assessing Significance for Historical Archaeological Sites and 'Relics'*, Heritage Branch of the Department of Planning, 2009, p 8.

[19] Croker, A, *Respecting the Vision: Sydney Opera House—A Conservation Management Plan*, report prepared for Sydney Opera House Trust, July 2017, Section 3.

Heritage List citations for Sydney Opera House do **not** include the site's archaeological potential. These listings focus on the Sydney Opera House, not earlier historical phases.

Prior archaeological work has demonstrated that the overall site contains some significant archaeological deposits, connected with earlier phases in the place's history—that is, before construction of the Opera House. Given the unique and location specific nature of the place's history, comparative analysis of the possible archaeological features, addressing the Bickford and Sullivan questions, are addressed through contrast against past excavation.

4.1.3 Current NSW Heritage Assessment

The Heritage Council of NSW established seven criteria for consideration in the assessment of heritage significance.[20] The potential historical archaeological resource of the study area has been assessed against these criteria and our findings are presented in Table 4.1.

Table 4.1 Assessment of Potential Archaeological Features Against the NSW Heritage Criteria.

Criteria	Assessment
(a) an item is important in the course, or pattern, of NSW's cultural or natural history (or the local area)	The archaeology of the study area is not associated with the Sydney Opera House, but rather the phases of historical development prior to the construction of the Opera House. At the state level, the study area has potential (albeit low) to contain archaeological evidence associated with the history of lime burning activities and **possibly** Fort Macquarie. Evidence of the original shoreline and the landform, combined with soil deposits, would be of state significance in the context of understanding the history of NSW. The study area has potential to contain archaeological evidence associated with the modification of the shoreline of Bennelong Point, **possibly** nineteenth- and twentieth-century buildings, and the twentieth-century tram operations. These items would be significant at the local level as a component of Sydney's public transport system.
(b) an item has a strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the local area)	The study area is unlikely to contain substantial archaeological evidence that could be identified as being associated with significant individuals or groups.
(c) an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area)	The potential archaeological resources within the study area are generally unlikely to contribute to the aesthetic significance of the site and are unlikely to meet this criterion.
(d) an item has strong or special association with a particular community or cultural group in NSW for social, spiritual or cultural reasons (or the local area)	The potential historical archaeological resources within the study area are unlikely to contribute to the social significance of the site and are unlikely to meet this criterion.
(e) an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the local area)	The research potential of the site's possible archaeological resource is discussed below according to various categories of potential evidence associated with the site's historical phasing.

[20] Heritage Branch Department of Planning, 2009, *Assessing Significance for Historical Archaeological Sites and 'Relics'*, State of NSW, Heritage Branch, Department of Planning, p 3.

Criteria	Assessment
	Development of the Shoreline The changing configuration of the land that is most closely associated with the first colonial settlement of Australia, from 1788, is a matter of historical interest. Archaeological evidence of the changing shoreline therefore has the potential to contribute to our understanding of the landforms that existed around Sydney Cove prior to colonial settlement and after land reclamation works in the nineteenth century. The study area has the potential to provide information on the process of land reclamation and infill. This evidence would be significant at the local level. **Incidental Remains Associated with Early Use and Development of Bennelong Point** There is low potential for incidental remains associated with unrecorded development or activities on Bennelong Point to survive within the study area. These remains may include artefact scatters, rubbish dumps or remains associated with undocumented structures or other site features. The research potential and value of such remains is difficult to ascertain at this stage and would be dependent to some degree on the extent to which these remains could be linked to particular phases of the site's history, development or use. However, the research potential of such remains is enhanced as the information that they may provide could generally not be obtained from any other source. Any such items are likely to be of local research significance. **Early Lime Burning** The study area has some potential for further evidence of the lime burning process and industry. The evidence could provide further information to deepen our understanding of the mechanics of production, the consequent use of the lime, and any connection with Fort Macquarie. This evidence would likely be significant at the state level. **Early Structures** The study area has a low potential to yield evidence of the small structure south of Fort Macquarie, present c1829 to c1845. This item has not been previously archaeologically identified, and the area subject to this study could provide the only evidence for the building's form, function and/or undocumented use. The value of any archaeological resource would need to be assessed on its integrity and ability to provide yield information. Substantial structural remains could hold value at the State level. **Fort Macquarie** Fort Macquarie represents a significant phase in Australia's defensive history, despite the fort's limited defensive capacity. The Gothic-style fort was a prominent landmark for its picturesque qualities. There is low potential for structural remains of the fort and associated deposits and features to be present within the study area. The research potential of these remains may include information about the construction and development of the fort as well as insight into the operation and occupation of the fort throughout its history. Archaeological features of the fort would likely be of state significance.

Criteria	Assessment
	The Naval Drill Hall The study area has some potential to yield evidence of the naval drill hall (c1890–1901). Evidence could be associated with the structure, its fabric and possibly deposits associated with its use. The size of the study area precludes the ability to understand the extent and layout of the building (beyond that shown in plans). Archaeological features of the drill hall would likely be of local significance. **Twentieth-Century Tram Operations** The study area has potential to contain infrastructure associated with the former tram house. Archaeological remains associated with the operation of the trams on Bennelong Point would have limited potential to yield information relating to the development of Sydney's public transport system that could not be provided by other sources. Whilst holding value for historical value (criteria A), there is little value in the research potential of this item.
(f) an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the local area)	Archaeological sites in the Sydney Central Business District dating to the nineteenth century are increasingly rare (as part of an ever-diminishing resource). Works in and around Bennelong Point have also diminished the extent of archaeological sites associated with the Sydney Opera House. Archaeological remains associated with modification of the shoreline, and early defensive sites, would be considered as rare surviving element of Sydney's history. The small size of the study area means that archaeological features and deposits within the study area are likely to extend away from the area of works—this would provide evidence for future management and the ability to conserve remaining archaeological evidence. The level of significance associated with the rarity of the deposit relates to the historical and research value of each specific feature. Development of the shoreline, early lime burning, early structures and Fort Macquarie are likely to be of State significance; the naval drill hall of local significance. Remains of the tram operation are unlikely to hold value under criteria F.
(g) an item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places or cultural or natural environments (or the local area)	The small size of the study area and extent of prior impacts to the study area means that any archaeological deposit uncovered is unlikely to be representative of the principal characteristics of the wider place.

4.2 Summary of Significance of Site Features

The following table summarises the significance of the site's features including potential archaeological resources.

Table 4.2 Summary of Significance Associated with All Potential Site Features.

Phase	Site Features	Date	Potential Remains	Significance
1–2	There is no specific development or land use activity recorded within the study area during this period.	1788–1802	Deposits associated with the original shorelines (eastern side of Bennelong Point) and the original landform.	State
			Evidence for the infilling of the original shoreline, with stone rubble filling crevices.	Local
			Quarrying cuts and convict drill marks on the bedrock.	Local
1–5	Rubbish dumps into water—later reclaimed land.	1788–1960s	Concentrations of artefacts within areas of reclaimed land beneath introduced fill deposits.	Local
3	Evidence of early lime burning activities on the eastern shoreline.	c1810	Deposits of shell and infrastructure associated with the process.	State
3	Rectangular structure shown on plan adjacent to eastern shoreline (form/function unknown).	By 1829	Structural remains (probably timber). Cuts in the bedrock associated with the structure.	State
3–4	Fort Macquarie. **NB unlikely to be positioned within the study area.**	1817–1901	Structural remains (stone, brick, timber) associated with internal and/or external features of or additions to Fort Macquarie.	State
			Deposits associated with occupation/use of Fort Macquarie (internal and external).	State
			Roadways or pathways around Fort Macquarie.	State
4	Drill hall.	1890s–1901	Structural remains (stone, brick, timber) and associated deposits and features.	Local
5	Tramcar house and associated infrastructure.	1901–1950s	Structural remains of tramcar house (stone, brick), tram tracks, roads, and footpaths extending from and adjacent to the tramcar house.	Local
6	Evidence associated with the construction of Sydney Opera House.	Post-1963	Construction debris and fills.	Nil

4.2.1 Statement of Historical Archaeological Significance

Sydney Opera House is an item of Outstanding Universal Value. However, the site's potential archaeological remains have no direct association with Sydney Opera House itself, nor with this significant phase of the site's history.

The site's potential archaeological resource is associated with various significant phases in the site's historical development that have influenced its current form. This potential is a continuation of that excavated in 2014 for the VAPS project. In particular, the study area has potential to contain archaeological evidence associated with the modification of Bennelong Point's shoreline, possibly Fort Macquarie, the early rectangular building and the naval drill hall, and the twentieth-century tram operations.

The changing configuration of the Bennelong Point foreshore is a matter of historical interest connected with early colonial development of Sydney. Archaeological and fossil pollen evidence retained against the modified shoreline has the potential to contribute to our understanding of the landforms that existed around Sydney Cove prior to colonial settlement and after land reclamation works in the nineteenth century. The investigation and study of early deposits may provide new and supplementary evidence to further palaeobotanical studies conducted on the Tank Stream Valley. These hold the potential to inform the historical record in relation to the changes to the ecology and introduction of agriculture in Sydney Cove and Farm Cove.

Archaeological remains of lime burning would provide additional information on the industrial process and its connection to Bennelong Point.

Archaeological remains associated with Fort Macquarie, including structural remains or associated deposits or features, would have archaeological significance and research potential for their ability to contribute to our understanding of this major period in the historical development of Bennelong Point.

Archaeological remains associated with the small rectangular building and the later drill hall would have archaeological significance for the potential to contribute information about these poorly documented buildings and their uses.

Archaeological investigation of infrastructure associated with the operation of the trams on Bennelong Point would have limited potential to yield new information relating to the development of Sydney's public transport system. These remains are of historical value in the course and patterning of the place.

5.0 Archaeological Impact Statement

5.1 The Proposed Works

The proposed works include the installation of a concrete mass thrust block within the forecourt area of the Sydney Opera House (Figures 5.1 and 5.2). The block will measure approximately 7m (east to west) by 5m (north to south), with a depth of 2.5m from the ground surface level. Excavation of a trench 9m (east to west) by 6m (north to south) by 3m deep will be required to install the thrust block. A works buffer zone of 14m by 14m is required around the excavation area. The size of the excavation area is 54m^2.

The location for the thrust block is based on an engineering solution to stabilise the Monumental Steps, and thus cannot be moved.

5.2 Evaluation of Impacts on the Potential Archaeological Resource

An evaluation of the study area's site formation and disturbance history (Section 2.3) defined that the eastern portion has been entirely impacted and unlikely to retain any archaeological features and/or deposit. The western portion, covering an area of ~27m^2, retains soil integrity with potential for archaeological deposits and features.

The proposed works will require complete excavation of the whole study area, to bedrock—a depth of ~1.15m below the ground surface. The sandstone bedrock will be cut to attain the depth of the trench necessary to pour the concrete mass for the thrust block.

Therefore, all soil deposits and the underlying bedrock, which could contain an archaeological deposit or feature, will be removed during the works.

5.2.1 Statement of Archaeological Impact

The proposed works would likely impact the state significant archaeological remains of deposits associated with the original shorelines (moderate potential), evidence of early lime burning (low potential), the rectangular structure (low potential), and Fort Macquarie (very low potential).

The proposed works would likely impact the locally significant archaeological remains of deposits associated with processes of infilling the original shoreline (moderate potential), rubbish dumps (low potential), the drill hall (low to moderate potential), and the tramcar house and associated infrastructure (moderate potential).

The small size of the study area means that should any of the above features and/or deposits be present, the impact would be partial and the deposit/feature would extend outside the zone of impact.

5.3 Recommended Mitigative Strategy

The significance of the site's potential archaeological resources is derived from historical values, the rarity of deposits and its research potential. Therefore, the adverse impacts associated with the proposed works could be mitigated by creating a record and archive of the site through appropriate archaeological investigation in association with the proposed site works to ensure that the research potential of the site is fully realised.

A process of archaeological salvage is proposed to investigate deposits within the study area, and record and remove any deposits and features, to bedrock. Post-excavation analysis of any archaeological features and relics should be undertaken. Structures should be subject to detailed recording. Analysis of intact soils should be undertaken for pollen and spores. Interpretation of any meaningful archaeological results would be warranted under the provisions of the CMP.

During the works, the work zone barriers could be used to mount media that publicise the outcomes of the previous archaeological investigations, which are not currently subject to permanent public interpretation. This is appropriate given the proximity between the thrust block location and VAPS works.

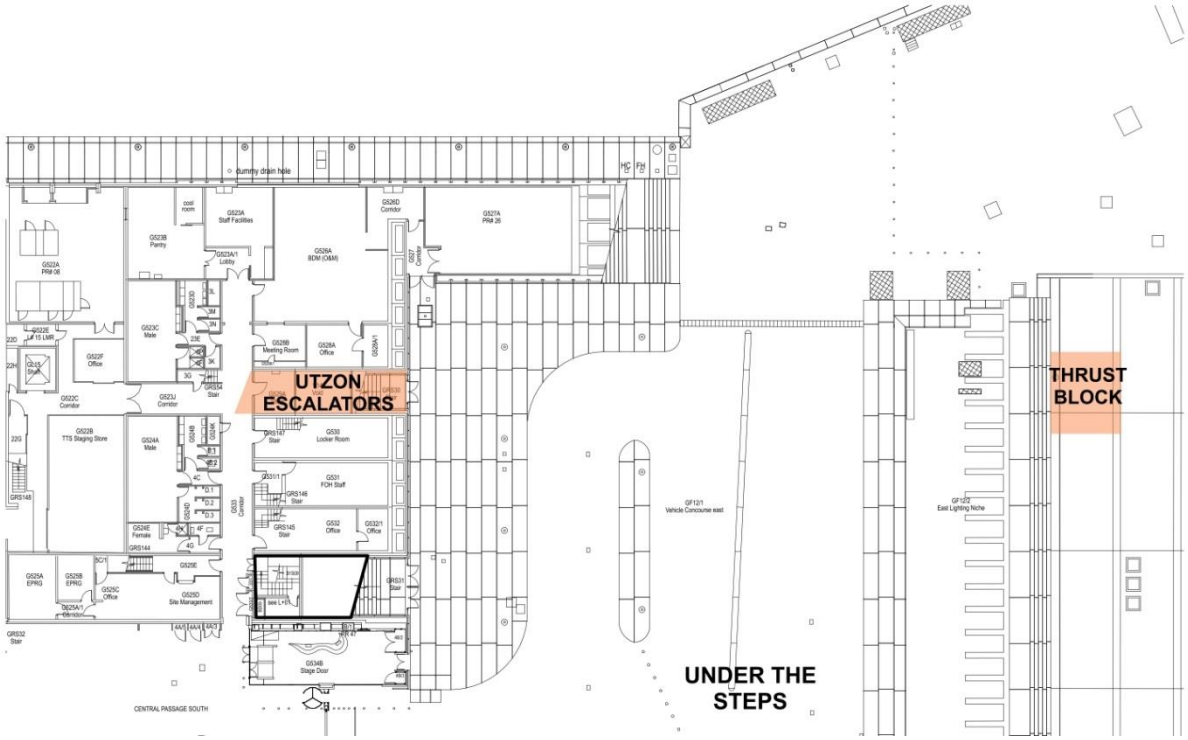

Figure 5.1 The location of the thrust block within the forecourt area, to the south of the Monumental Steps. The area of works measures approximately 7m (east–west) by 5m (north–south), with a depth of 2.5m from the ground surface level. (Source: Sydney Opera House 2018)

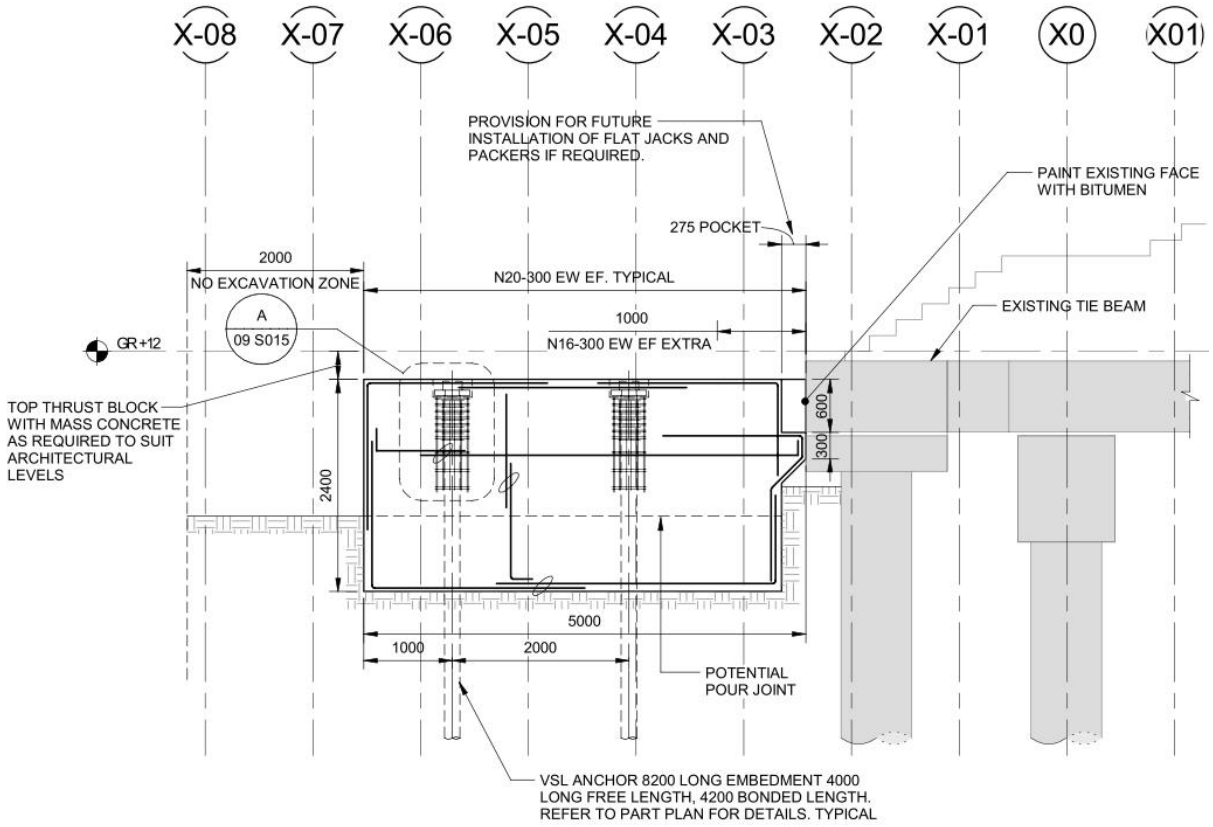

Figure 5.2 The north–south extent (5m) and depth (2.5m) of the thrust block. (Source: Sydney Opera House 2018)

6.0 Archaeological Research Design and Excavation Methodology

This section of the report provides an Archaeological Research Design and a proposed investigation and recording strategy to mitigate the impact of the proposed works (Section 5.1) on the site's potential archaeological resources (Section 3.2). This aligns with CMP Policy 20.10. This investigation would be undertaken in accordance with a research framework (Section 4.3) that would guide the information to be recovered from the site during the proposed investigation.

The size of the works is small, and around half of the works area holds no archaeological potential. Therefore, this Archaeological Research Design recommends a single program of archaeological work in conjunction with, but prior to, the pouring of the mass thrust block—phases of testing followed by salvage are not feasible. It is proposed that archaeological management becomes a stage of the whole works program, excavating the fills and all archaeological deposits from the works zone to the depth of bedrock. Following removal of archaeological deposits and features, the construction work could proceed.

Elements of the proposed works would require the disturbance of archaeological relics that are protected under the Heritage Act. This Archaeological Research Design has been prepared as accompanying documentation for an application to the Heritage Council of NSW for approval to disturb or remove these remains in association with the proposed site works. This section includes a research framework and excavation methodology to guide the proposed investigation of the site to ensure that its archaeological remains are appropriately managed throughout the investigation.

6.1 Method of Construction

The method of construction (for the thrust block) has been detailed in several stages, from preparation to excavation, installation to site restoration. The stages are detailed below; archaeological excavation is detailed as a specific stage of works.

- Site preparation—the site will be isolated from the public with barriers. A dedicated entrance will be established. If possible, the barriers could be used for archaeological heritage interpretation.
- The surface cover of granite will be recovered and stored. The overlying layer of concrete (as seen in Figure 2.17) will be cut to provide a total work area (Figure 3.2). The concrete will be removed, which will present an upper layer with service trenches and 'fill'—similar to the appearance of the site in Figure 2.17.
- Archaeological excavation and recording will commence, following the methodology below. Archaeological works would continue until any archaeological features and deposits have been recorded and removed and/or the works zone holds no further archaeological potential. This would be to bedrock, a depth of ~1.15m.
- Any services would be isolated and wrapped.
- The trench may require sheet piling to be installed around the outside of the works zone.
- The thrust block installation trench would be cut through bedrock to a depth of ~3m.
- The thrust block concrete would be poured.

- The site would be re-established and re-opened.

6.2 Historical Themes and Research Questions

6.2.1 Historical Themes

The proposed archaeological investigation of the site should consider physical evidence associated with the historical development and occupation of Bennelong Point and its surrounds within a broad thematic context. New South Wales Historical Themes have been compiled by the Heritage Council of NSW to assist and focus research into heritage places within a broader research framework, beyond the site itself.

The NSW Historical Themes that are potentially relevant to the study area include:

- Environment—cultural landscape—activities associated with the interactions between humans, human societies and the shaping of their physical surroundings.
- Defence—activities associated with defending places from hostile takeover and occupation.
- Industry—activities associated with the manufacture, production and distribution of goods.
- Transport—activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements.

6.2.2 Site-Specific Research Framework

Investigation of the site may allow a number of specific questions to be addressed. These questions arise from considering the available historical documentation of the site's development and occupation, observing its physical condition and assessing the specific nature and extent of the archaeological remains that may survive there.

Site-specific research questions that may be addressed through physical investigation of the archaeological resource include:

- What can the fill deposits relating to land reclamation activities tell us about the original and early configurations of the western shore of Bennelong Point? How was the natural landform modified to accommodate development?
- Does the site contain any intact natural or topsoil deposits that may contain evidence of Aboriginal occupation of the area, either prior to the arrival of Europeans in 1788 or during the early colonial period?
- Does the site contain evidence for historical topsoils? Do these contain a pollen or spore signature, which informs the historical palaeobotanical record? How does this differ to the reconstruction of the 1788 environment in the nearby Tank Stream Valley?[21] Is this a factor of positioning between the Sydney Cove and Farm Cove? If different, did the local environment contribute to the early

[21] Macphail, M, Owen, T, and Thorp W, forthcoming, 'The ecology of the lower reaches of the Tank Stream Valley and foreshore in Sydney Cove, NSW, in the late Holocene and point of Colonial settlement, 1788. New plant fossil evidence from 200 George Street, Sydney', manuscript in review by Australasian Historical Archaeology.

pattern of colonial/Aboriginal land occupation and history (as described in the CMP for First Government House[22])?

- How does the archaeological evidence of the shoreline relate to historical plans and images of it? Does it shed light on the veracity of well-known historical plans and illustrations?
- Does the site contain any evidence of early rectangular building or the drill hall? Are these features likely to extend beyond the study area? What does this evidence tell us about the nature and form of these structures or their occupants?
- Does the site contain any evidence of unrecorded buildings or other site features? Is there further evidence of lime burning? How does this relate to that previously uncovered? If so, what does it tell us about the economy of lime production?
- Do any subsurface remains of Fort Macquarie survive within the study area? Does this evidence provide any new information about the design, operation or occupants of the fort?
- Can the subsurface remains be associated with any other recorded structures on Bennelong Point? Can specific operations be identified?
- Do any other deposits or artefacts associated with the use and occupation of Bennelong Point survive? If so, what do they reveal about the site's use and history?
- To what extent did periods of redevelopment and modification of Bennelong Point throughout its history disturb or protect the site's archaeological resources?

6.3 Archaeological Investigations

Archaeological investigation would commence once the overlying concrete has been cut and removed. A small four-tonne excavator would be used to assist in the excavation and removal of non-archaeological fills/deposits.

- The works zone would be mechanically excavated under the supervision of the excavation director. All archaeological machine excavation undertaken will occur in a controlled manner (removal of ~50mm at a time). The mechanical excavator will be fitted with a mud bucket to minimise the disturbance to archaeological remains and ensure that soil profiles are not unnecessarily mixed.
- All exposed archaeological remains will be cleaned by hand and manually excavated. Manual excavation will be undertaken with trowels, shovels, hoes, picks, brushes and coal shovels.
- Archaeological recording of features and deposits will be undertaken in line with best practice procedures (refer to below).
- If potential underfloor deposits were encountered in association with any historical building, the following procedure would be enacted:

[22] GML Heritage, Site of First Government House—Conservation Management Plan, Volume 2, prepared for Sydney Living Museums, October 2016, pp 74–76.

  - manual excavation to define the extent of potential underfloor deposits within the works zone;
  - the excavation area is very small, however if possible a 1m x 1m grid would be established across the extent of potential underfloor deposits;
  - excavation of all intact and significant underfloor deposits in a grid pattern, with excavated deposits wet or dry sieved (depending on matrix); and
  - excavation of disturbed and patchy underfloor deposits as a single unit and sieved.
- Intact soil horizons will be sampled and subject to pollen analysis.
- Samples from lime burning and/or shell would be collected and subject to analysis.
- Salvage excavations will cease when the site's research potential has been fully realised and all significant archaeological remains investigated, removed and recorded. If intact bedrock is present, this will be cleaned and recorded.
- There is no proposal to expand the archaeological trench beyond the works zone.

6.4 Recording

The recording of archaeological data would be based on the single context recording system. Phasing and interpretation of the archaeological features in relation to the entire site would also be included in the record sheets and survey. The following outlines the recording process:

- The works trench would be accurately surveyed and recorded using photogrammetry. Any archaeological features would also be recorded using photogrammetry, which creates a 3D model of the site.
- Archaeological structural remains, deposits and features would be recorded on context sheets.
- A digital (JPEG file) photographic record of the archaeological program would be made. Significant archaeological remains would be recorded using both JPEG and RAW digital capture. All photographs would include a scale and north arrow.
- Scale drawings would be prepared and include location of archaeological remains within the overall site. A surveyor would take georeferenced survey data to prepare survey drawings.
- Mud maps illustrating locations of significant finds will be created to supplement the digital data gathered.
- Registers of contexts, photos, samples and drawings would be kept, digitised and collated for storage at the completion of archaeological investigations.

6.5 Artefacts and Samples

Artefacts may be retrieved from the archaeological excavation. The following outlines the artefact collection strategy for this program of archaeological investigations:

- Artefacts from significant and in situ deposits, such as underfloor deposits or rubbish pits, would be collected by context and retained for analysis and archiving.

- A sample of artefacts from non-significant fills, such as twentieth-century fills and demolition material, would be retained to aid interpretation and assist in answering research questions.
- Diagnostic, complete and potentially significant artefacts from non-significant layers and disturbed fills would be collected and retained for the archive and potential interpretation. Examples of such material include:
  - whole ceramic and glass vessels;
  - partial ceramic and glass vessels which include rim or base sections, or identifiable patterns;
  - identifiable ferrous and non-ferrous nails, horseshoes, horse and farm equipment; and
  - buttons, coins, clay pipe bowls and other personal items.
- Building material (brick, mortar, timber etc) and environmental samples (soil, pollen) would be collected for further analysis, archival purposes and to inform archaeological interpretation and answer research questions.
- Artefacts and building material samples would be analysed by a historical archaeologist /artefact specialist with experience in historical archaeological assemblages from the Sydney region. A catalogue and analysis report would be prepared.
- Environmental samples, shell samples and faunal remains would be analysed by an appropriate specialist.
- Following analysis, all artefacts will be provided to Sydney Opera House Trust for management in line with CMP Policy 18.24.

6.6 Post-Excavation Report

A succinct, summary statement of findings would be prepared following the excavation. This would detail the key findings and detail requirements for consequent post-excavation analysis. This statement would be submitted to the Heritage Division, prior to salvage commencing.

If the works zone has been entirely disturbed to bedrock, with no archaeological features and/or deposits being identified, a short letter will be prepared detailing the methodology of investigation and the outcomes. No further reporting would be prepared.

Should archaeological deposits and/or features be present, a post-excavation analysis of the findings, artefacts and samples would be undertaken. A final report would be prepared and include the following:

- detailed description of the archaeological program;
- detailed description and analysis of the archaeological findings, phasing and interpretation;
- photographs, scale drawings/surveys and interpretive graphics;
- results of artefact analysis including a catalogue;
- results of building material and environmental sample analysis;
- response to the research questions; and

- reassessment of archaeological significance and identification of any remaining resource within the site.

6.7 Archaeological Team

Dr Timothy Owen would be the nominated Excavation Director, responsible for the overall archaeological program and compliance with the conditions of the Section 65A approval. Abi Cryerhall would also be nominated as an Excavation Director and provide support for the fieldwork and post-excavation analysis.