What lies beneath the Sydney Opera House?

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Abstract

When Australia celebrated the bicentenary of European settlement in 1988, a high profile bicentennial project was the construction of a new lower concourse for the Sydney Opera House. During excavations some giant chains were recovered. The 'Sydney Cove Chain' was ultimately identified as (British) Admiralty Pattern Mooring Chain (APMC).

Much less well known than Admiralty Pattern Anchors and Buoys, APMC is likely to persist on seafloors at British anchorages around the globe due to it's high quality iron composition and hefty design - each link measures around 1 metre in length and bar width is typically 60 – 100 millimetres (mm). Also, because it sits on the sea floor, often beneath a layer of silt, APMC is likely to be well preserved by these anoxic conditions at many locations.

In the case of the Sydney Cove Chain there is good evidence to support the theory that at least some elements travelled with the second Governor to the Colony of New South Wales in 1795 – just seven years after first settlement. There is also evidence that these same chains were used by Matthew Flinders to moor the ruined *H.M.S. Investigator*, after completion of the first circumnavigation of Australia in 1803.

More startling than this is the possibility that such chains were used in the boom defence of Sydney Harbour, against such potential foes as the French, Russians, Spanish and Americans. In fact, between Napoleonic wars the French scientific expedition led by François Baudin camped with permission yet unease on Bennelong Point – the site of the current Sydney Opera House. What other archaeological treasures remain buried in this area?

In 1987 the contract archaeologist monitoring the building site determined that it was too disturbed to yield significant archaeological evidence (Higginbotham 1987b:8; NSWHO / DUAP 1996:8-9). Master's research in 2003 questioned this conclusion, and presented a 'statement of significance' containing more positive findings (Bullock 2003).

Where it all began

In 1988 Australia celebrated 200 years of European settlement.[2] It was the biggest party Australia had ever seen!

Many and varied preparations were made across the country to commemorate the event in which heritage featured. As a newish country settled by Britons (but only just), there was collective soul searching about what it might mean to be Australian at that time.

Officially discovered in 1770 by Captain James Cook of the Royal Navy while searching for the fabled Great Southern Land, Britain realised the use it could put Australia to at about the time it lost the War of Independence in North America (1786-1783) – Australia was established as the largest gaol the world had ever seen.

The most 'iconic' site in Australia is Sydney Cove. It is where the ships of the 'First Fleet' dropped anchor on 26 January 1788. It is now instantly recognisable the world over as it is framed by the Sydney Harbour Bridge on its western headland (Dawes Point), and the Sydney Opera House on its eastern headland known as Bennelong Point - named after the Aboriginal Australian who lived there for a while at the first Governor's pleasure.

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[2] For many of the original inhabitants of Australia the occasion became known as 'Invasion Day'.

Figure 1. Sydney Cove: the site of first settlement of Australia, with the Sydney Opera House in the foreground and the Sydney Harbour Bridge in the background. The archaeological material discussed here was recovered from the land near the 'East Sydney Cove' label.

Bennelong Point served as a site for many functions – livestock pen, limeworks, saltworks, sandstone quarry, Governor's landing place, inter-racial laboratory, guest campsite (Malaspina 1793; Baudin 1802), defensive battery then fortification, promenade, parade ground, horse ferry, boat shed, steamship wharf, tram depot, and finally Australia's most recognisable opera house (Kerr 1993:1-13). One bicentennial celebration project was to create a new lower concourse for the Sydney Opera House with shops and extended promenades.

Bennelong Point remained public land, despite challenges from the world of commerce - which nevertheless encroached from the western shore. After the construction of the Sydney Harbour Bridge by 1932, a more picturesque use for Bennelong Point than the obsolete Fort Macquarie Tramshed was proposed by the city fathers in the 1950's. An international competition to design a 'National Opera House' was announced in 1956.

The competition was won by Dane Jorn Utzon, with his 'white sails' design. It was a long and difficult building project, partly because of the innovative design which presented new problems, and partly due to the personalities involved. Utzon left the project well before it was finished and the work was completed by the New South Wales Public Works Department (the Department).

Archaeological investigation
Up to the time of the opening of the Sydney Opera House in 1973, it appears that no official archaeological investigations had been carried out on the site.

In 1986 the Department began to dig up the past towards the creation of the bicentennial lower concourse.

An official permit to investigate the archaeology of the site was not sought or granted under the State Heritage Act, and so any recovered material did not officially have to be conserved, or lodged anywhere. However, when demolishing a seawall on the western shore of Bennelong Point (also known as East Sydney Cove or East Circular Quay), some intriguing large-scale objects were discovered.[3]

Figure 2. Lengths One (right) and Three (left) of the 'Sydney Cove Chain' near the find location at the Sydney Opera House forecourt 1986. Reproduced courtesy of the Australian National Maritime Museum.

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[3] It should be noted that at this heady time in Australia's history, proper civic planning and development procedures were sometimes not followed. In Sydney, public outcry focussed on expedited development of the next large bay to the west of Sydney Cove, known as Darling Harbour (location of the Australian National Maritime Museum), which was modernised with considerable disregard for heritage.
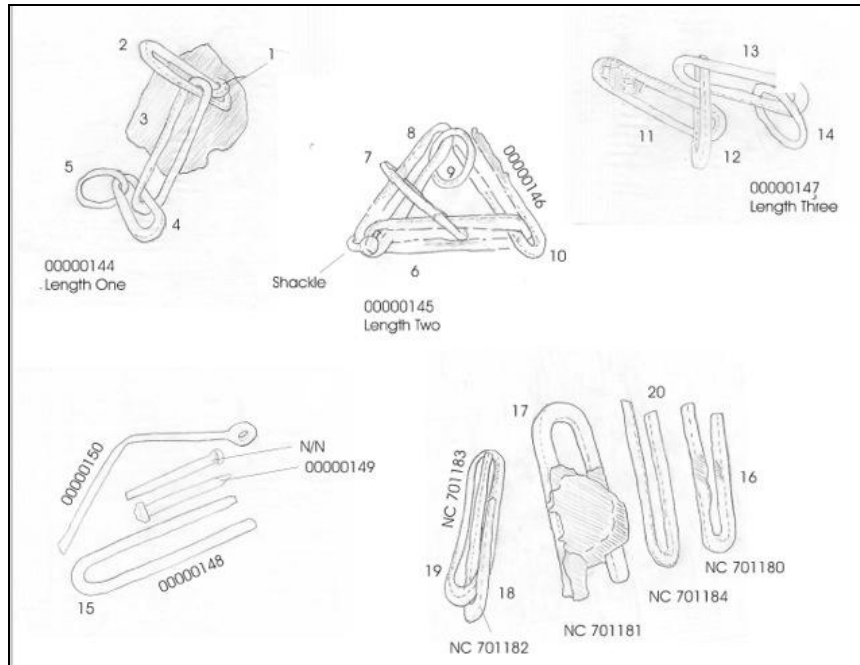
Figure 3. Archaeological material donated to the Australian National Maritime Museum (ANMM) from the Sydney Opera House site in 1987. ANMM Registration Department assigned 'Object Numbers' (00000XXX, N/N, NCXXXXX), and link numbers 1 – 20 used in Bullock (2003) are shown. 'Sydney Cove Chain' material includes all links, rings and staples numbered 1 – 20. Engineering_artefacts N/N, 00000149 and 00000150 are not directly related to the Sydney Cove Chain, but were recovered from the same archaeological site. Drawn by V. M. Bullock from object photographs. Not to scale.

It appears that the Department engaged an archaeologist from November 1986 until August 1987 to conduct 'archaeological monitoring' of the site, almost as an afterthought. This type of minimal archaeological investigation is usually recommended because a site is likely to have low significance or because it has been so disturbed through usage that any archaeological evidence yielded would be of limited value due to compromised archaeological context (NSWHO / DUAP 1996:8-9).

When the first large-scale objects were excavated and began reacting adversely with the above-ground atmosphere a metals conservator from the fledgling Australian National Maritime Museum (ANMM) was consulted. In due course many of the recovered objects were acquired into the National Maritime Collection (Higginbotham 1987a; Higginbotham and Bullock 2003; Hughes 1987:18).

The archaeologist, Edward Higginbotham, began by documenting two sections in the vicinity of the discovered objects at Bennelong Point. The sections were located about 40 metres apart, midway between the eventual find sites, which were roughly 200 metres apart. The sections reveal seawall and slab construction from different engineering phases at the tidal location - built over piles, tar, concrete, rubble, fill, silt, soil, mud, slurries or sandstone bedrock. He found the type of material typical of past activity at many historic engineered sites e.g. salt glazed ceramic pipes, wooden fittings

(wharf and deck structures), large scale metal fittings (including fixtures for seawall and perhaps for cranes), and also glass bottles and broken glass (Higginbotham 1987b).

Higginbotham considered that the deposits were associated with a seawall completed in 1884 relating to Circular Quay (Sydney Cove) commercial shipping. This determined the theme under which the objects were acquired into the National Maritime Collection as 'Economic and Commercial History'. His 1987 conclusion, 'confirmed the absence of archaeological deposits associated with the early development of Sydney Cove and Circular Quay' (Higginbotham 1987b:8).

On Australia Day, 26 January 1988, Queen Elizabeth launched the bicentennial celebrations for Australia at the Sydney Opera House, and in 2007 the Sydney Opera House became a World Heritage Site (UNESCO 2007). .

The Sydney Cove Chain Conservation Plan

The 2003 'Sydney Cove Chain Conservation Plan' (the Conservation Plan) reduced the uncertainty surrounding the significance of the Sydney Cove Chain by calibrating visual and documentary evidence to revise back the dates of deposition of the artefacts by at least 20 years, and firmly identified the chain artefacts typologically with initial naval usage of the Cove - from the arrival of the second fleet in 1795 until the navy moved operations one bay to the east (Farm Cove) in 1841.

Condition problems (delaminating stone and metal surfaces) and lack of time to conduct conservation or significance assessment led to suggestions by 2000 that the objects be de-accessioned It was at this point that the objects were suggested as the subject of a student project – in the first instance to devise a treatment regime compatible with both metal and stone components. Once this was done, however, it became clear that no treatment would be undertaken unless someone could show that the objects were of some significance. This is when conservator turned into curator, as relevant staff curators still had no time to investigate the significance of the objects.

Sydney Cove Chain 'statement of significance'

Following is the 'statement of significance' [4] created for the ten items comprising the Sydney Cove Chain acquired into Australian National Maritime Collection (ANMM) in 1987:

> The massive wrought iron chain pieces recovered from Sydney Cove in 1986-1987 are typical Admiralty Pattern Mooring Chain deployed around the globe between approximately 1580 and 1988. These objects are rare in Australian maritime experience and unique in Australian maritime collections, because such chains are commonly left *in situ* on the seafloor to continue serving as permanent moorings – or are abandoned. The Sydney Cove Chain was imported from Britain and used to moor hulks and convict transports in Sydney Cove shortly after English settlement (~1795-1823+), during the primarily naval phase of use of the Cove.

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[4] A 'statement of significance' is 'a reasoned, readable summary of the meaning, values and importance of an item or collection. A statement of significance makes the importance of items and collections accessible to a wide audience.' (Russell and Winkworth 2009:63).

The Chain tells us about naval equipment and practice at a time before the full phasing in of chain for shipboard use (beginning 1817), and the incorporation of a clump anchor, hewn from local rock, is symptomatic of the shortages of naval stores experienced in the colony.

There is evidence to suggest that Captain Matthew Flinders laid such a chain for his hulked ship *H.M.S. Investigator*, after completion of a major part of his circumnavigation of the continent he named Australia. Apart from association with the earliest period of English settlement, the Chain is also connected with later phase commercial usage of Sydney Cove, as parts of it were dredged up and used as fill behind civic seawalls from around 1860.

The Sydney Cove Chain is in poor condition and in need of conservation treatment. The iron retains friable but treatable original surfaces, and the corrosion expansion of one link threatens the integrity of the sandstone clump anchor. The rarity and representativeness of the Sydney Cove Chain and related artefacts is significant for early Australian history, and a range of significances have been assigned to the objects according to archaeological provenancing detail.

The capacity of these extremely heavy gauge objects to support interpretations of the past, which seek to demonstrate the stamina and ingenuity of earlier generations in creating and positioning equipment, without motorisation, or making-do in local circumstances (clump anchor), is also significant. The Sydney Cove Chain may also be used to interpret late eighteenth-early nineteenth century quarrying practice, wrought iron production and chain production, as well as the naval practices of mooring and boom defence.

Admiralty Pattern Mooring Chain

A fundamental problem with the Sydney Cove Chain when research began was that no-one consulted at the ANMM or the Sydney Heritage Fleet had seen chain of that large size before. Each of the three lengths comprise three iron links approximately 1 metre long each, and one ring. Length One is attached to a large sandstone block with a similarly large iron staple. The heavy gauge of the Chain is extraordinary – the bar it was made from ranges between 2 and 4 inches in diameter.

After a national and international search the object type was finally identified by the Chief Salvage and Mooring Officer of the Ministry of Defence in the United Kingdom, Mr Morgyn Davies O.B.E., as 'Mooring Cable, Square Link' or Admiralty Pattern Mooring Chain (APMC) (Davies 2003a). He explained that its main usage in British Admiralty permanent moorings meant that it mostly remains on the seafloor, where it is often purchased *in situ* by commercial port managers in the knowledge that a diver check will confirm that corrosion and fouling are not advanced (Davies 2003b).

Whether made from wrought iron, cast iron, forged steel or cast steel, the heavy gauge and high quality metal used in Admiralty Pattern designs, the absence of a welded stud link between each long side (as found in ship-board chain), and location on the seafloor often in a layer of silt, promotes corrosion resistance. Davies is aware that all production types continue in active use at many locations around the world (Davies 2003b).

The Sydney Cove Chain appears to be made from rolled wrought iron. It is not now possible to tell whether it was also oiled, painted or tarred against rusting, although it may have been 'case hardened' [5], with the same aim in mind. Testing revealed high

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[5] Surface carbon layer added during forging process.

phosphorous content, which along with sulphur is a traditional corrosion inhibiting inclusion. Metallurgical analysis concluded that the phosphorous content indicated an English origin, even though archival evidence was found of massive chain production in Australia by at least 1822 (SRNSW 6053 4/1756:152-155).

The Conservation Plan traces Sydney Cove mooring patterns from the first day of European settlement. The muddy bottom and rocky foreshores were found to favour the local creation of clump anchors, and the three lengths of chain may represent specific usage in 'Resilient type' or 3-arm' moorings, but they may also have been used in 'Trot', 'Single', or as Matthew Flinders' log book attests, in 'Bridle type four-arm' moorings (Curryer 1999:137; L C of A 1951:154).
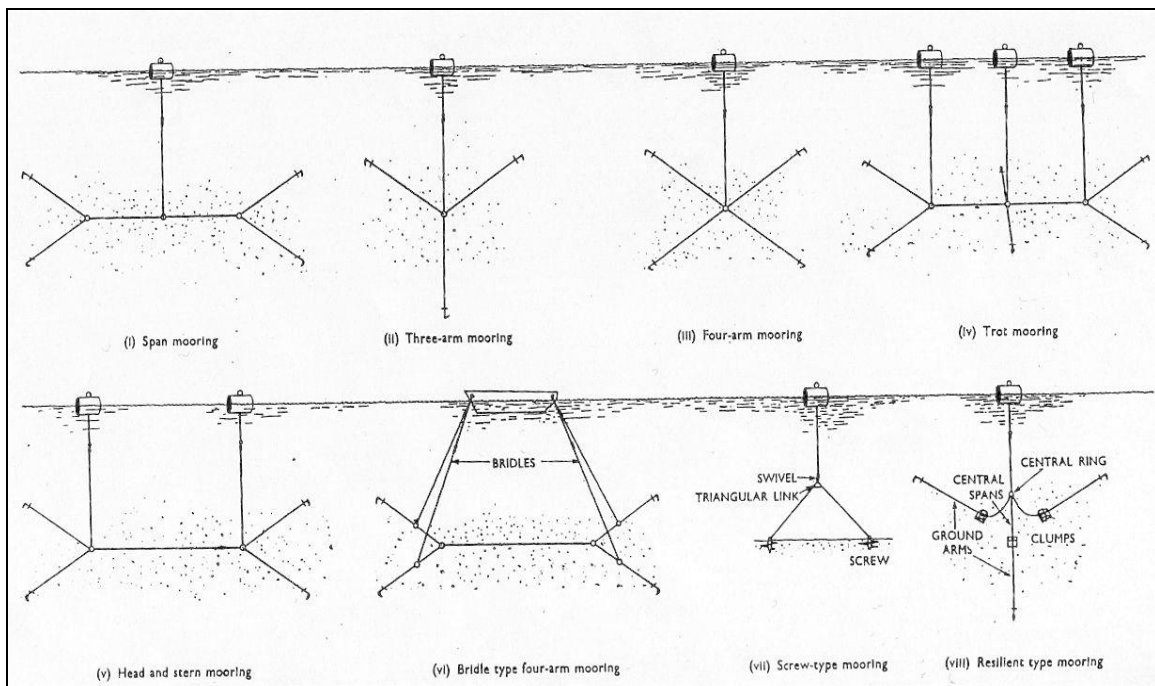

Figure 4. Types of moorings for ships.
Lords Commissioners of the Admiralty 1951:154.

An alternate use of APMC is in the construction of defensive chain barriers and booms. Research revealed large iron chains to keep unwanted shipping away from certain locations from at least the Fourth Crusade in 1203, when the Venetians broke the chain protecting Golden Horn Bay on the Bosphorus. They carried it back to Venice, along with the four bronze horses from Constantinople's Hippodrome which now adorn St Mark's cathedral (Diamant 1989:87). Various locations in England, Europe, the Mediterranean and North America have been defended in this way.

Notable examples include 'ye mightie chayne of iryne' which failed to stop the Dutch invading a tributary of the Thames to steal the English flagship *Royal Charles* in 1667, and 'George Washington's Watch Chain', which succeeded where Benedict Arnold failed, in deterring the British at West Point in 1780 (Diamant 1989:1-2). In the

American Civil War (1861-1865) the Confederates [6] were credited with being particularly inventive in such matters of the emerging field of 'psychological warfare' (Diamant 1989:xv). At Charleston they combined Dutch *chevaux de frises* timber bulwark and iron spear technology with chains to flummox Union ship captains (Diamant 1989:39).

Debate raged for centuries as to the effectiveness of chains and booms as deterrents (Baker Brown 1910:7; Clinch 1915:210, 215). Consensus found that, if deployed, defensive chains and booms should be operated from and protected by the firepower of overlooking fortifications on headlands (Corp. of Royal Engineers 1853-1862:172, 288).

This matter was played out in Sydney as naval, military and civic advisors informed successive government enquiries into Colony defences. The two main schools of thought battled over whether to focus on protecting Sydney Cove or the larger Sydney Harbour (Port Jackson), closer to the open ocean (Bullock 2003:117-122; Austin 1979:264, 150; SRNSW 6052 4/1752:156. With batteries [7] on Bennelong Point and Dawes Point just 666 metres apart, Sydney Cove was amenable to such defensive chain deployment.

From first settlement batteries had been 'thrown up' along Sydney Harbour in panicked reaction to European conflicts e.g. Garden Island in 1796 against the French and in 1820 against the Russians (Macey 2002); George's and Middle Heads against the Spanish from 1801 (Austin 1979:151; Hendy-Pooley 1903:135). The French were the abiding enemy, with their presence being felt from the first with de La Perouse's vessels only prevented from making landfall at Botany Bay by strong winds, as the British First Fleet scouted the same Bay for a suitable settlement site in late January 1788 (Marchant 2011).

Fear of America was fuelled by the 1839 clandestine appearance of Captain Charles Wilkes' U.S. Naval Expedition in Sydney Harbour. He bragged, 'Had war existed, we might, after firing the shipping, and reducing the great part of the town to ashes, have affected a retreat before daybreak, in perfect safety' (Jones 1986:13).

By 1873 visiting English novelist Anthony Trollope made the following observations about the 'martial ardour' of Sydneysiders (Dow 1966:36):

> I had previously no idea that the people of New South Wales were either so suspicious of enemies, or so pugnacious in their nature. I found five separate fortresses, armed, or to be armed, to the teeth with numerous guns – four, five or six at each point – Armstrong guns, rifled guns, guns of eighteen tons weight, with loopholed walls, and pits for riflemen, as though Sydney were to become another Sebastopol [8]…There was a boom to be placed across the harbour, and a whole world of torpedoes ready to be sunk beneath the water, all of which were prepared and ready for use in an hour or two. It was explained to me that 'they' could not possibly get across the trenches, or break the boom, or escape the torpedoes, or live for an hour beneath the blaze of guns. 'They' would not have a chance to get at Sydney.

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[6] The Confederate States were the southern states of the now United States of America. During the American Civil War the southern and northern states were at war.

[7] A defensive battery is a simple form of defence and comprises earthen or stone walls, cannons and / or rifles, along with people trained to fire ammunition and return fire.

[8] Sebastopol was the capital of the Crimea. The Crimean War was waged between Great Britain and Russia between 1892 and 1896.

A comprehensive scheme for upper harbour protection with booms and large chains was proposed to Parliament in 1863, and there is some evidence that materials were bought. To date, however, there is no evidence that such defences existed at the mouth of Sydney Cove. The matter of the effectiveness of these deterrents was decided with the invention of more powerful guns and mines, and the consequent outdating of fortifications. Also, Australians seemed finally and uneasily to accept the English philosophy: that by maintaining its maritime supremacy in the Northern Hemisphere attacks on its interests on the far side of the world would be averted (Lambert 2001:100-104).

Conclusion

Australia's 1988 bicentennial party caused the Sydney Cove Chain to be discovered. It is unfortunate that the opportunity to conduct a more serious archaeological investigation was not taken at the time, as quick work left the ANMM, as custodial institution, with long-term challenges concerning these surprisingly delicate objects.

The Conservation Plan allowed deeper investigation. A number of firm results reduced the uncertainty surrounding the assemblage, and twenty-two recommendations cover the topics 'General Heritage and Museum Practice', 'Implementation of Conservation Plan' and 'Significance Research', making the path clear for the Museum when it is in a position to act (Bullock 2003). Most of the recommendations can be achieved in-house.

A major external recommendation is that heritage bodies acknowledge the ongoing difficulties cases like the Sydney Cove Chain confer on custodial institutions, and that they adjust and enforce their regulations to avoid such outcomes. In 1996 the New South Wales heritage legislation and bureaucratic structures changed for the better (NSWHO 1996, 2002), but some feel that still more could be achieved for historical evidence (Heritage Act Review Panel 2009; Curby and McClean 2009).

A further bold recommendation is internal to the collecting institution – that it seriously address its object accessioning backlog before trails go cold. To this end some alternatives were suggested, ranging from engaging student volunteers or paid extra staff in a significance assessment and documentation drive, through to implementing a moratorium on new acquisitions until backlogs are addressed. In view of the Conservation Plan research it was also suggested that the objects should be reclassified under the 'Maritime Archaeology and Ship Technology', 'Naval Service in Australia', or even 'Colonial Exploration' (rather than 'Economic and Commercial History') collecting themes, pending evidence obtained through further significance research.[9]

The Sydney Cove Chain is positive proof that archaeological deposits at Bennelong Point may indeed hold keys to a range of early usages at this site of fundamental importance to Australia's history and identity. As significance assessment changes when new evidence becomes available and according to the perspectives of the people consulted, I hope that further evidence comes to light following the 'Significance Research' recommendations in the Conservation Plan. This should further

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[9] Please note that the ANMM Collection Development Plan was updated in 2005, so the particular collecting theme names would now need to be adjusted.

reduce uncertainty about these unusual objects, as well as other aspects of Bennelong Point's past.

Epilogue

The Sydney Opera House Conservation Plan of 1993 has been updated twice. The third edition dated 2003 describes the bicentennial lower concourse building works of the late 1980's, assigning to these modern works a 'B' level of significance i.e. 'considerable significance'[10] (Kerr 2003:33). The eminent author of this report James Semple Kerr recognises the surviving parts of the 1860's seawall as one of the two major surviving elements of early occupation of the site in this area. Although, 'encased in concrete or buried in mud' (Kerr 2003:94) he recommends its removal only, 'where it becomes necessary for the stability of the broadwalk or associated structures above' (Kerr 2003:57). Kerr concludes that the Bennelong Point site 'is now so heavily disturbed that sub-surface cultural remains are limited' (Kerr 2003:94).

Although official comprehensive investigation of Bennelong Point seems out of the question now, development work has continued at the site e.g., the Sydney Harbour Tunnel (1992) (passes underneath this archaeological locale); the Sydney Opera House Parking Station (1993). The fullest report on the archaeological potential Bennelong Point appears to have been produced in preparation for the current general site development in 2010 (GML 2010). One result is that this year archaeological investigation is being made of the other element that Kerr noted as significant: a nineteenth-century Bennelong Drain (GML 2010).

After learning of this work I contacted the consultants to make them aware of the Higginbotham reports and the Conservation Plan, in the hope that they may recover some better provenanced APMC material, or perhaps even some anchor points for a Sydney Cove chain defence!

Acknowledgements

Abbreviations

NSWHO	New South Wales Heritage Office
SRNSW	State Records of New South Wales

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[10] The scheme ranges from A = exceptional significance to D = little significance.

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