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INTRODUCTION

This document has been prepared to supplement the Port Hacking Integrated Environmental Management Plan Volume 1. Its aim is to provide background information and to provide in abbreviated form an understanding of Port Hacking’s origins and its dynamics. The material here presented is an extract from the Port Hacking Plan of Management (Sutherland Shire, 1992), the Port Hacking Marine Delta, Management Options (PWD, 86013) and additional research material. We gratefully acknowledge the support of Mr. David Messent and Mr. Les Bursill, Aboriginal Living Sites Survey Team, for some of the photographs and Ms Mary Dallas, “Sutherland Shire Council Aboriginal Cultural Heritage Study”. A list of the figures with acknowledgement to authors is included.

While the presentation has been divided into natural and human environments some overlapping is unavoidable. However, the critical task has been to show the inseparability of the physical components from the biological and human elements. Likewise, that inseparability exists between the catchments of the Hacking River and Port Hacking, and the waterways themselves.

Human occupation, but in particular European occupation, has increasingly presented challenges for the management of the impacts of the many and various terrestrial and waterway activities.

Sutherland Shire Council, NSW Maritime and the Department of Conservation and Climate Change each has plans of management relating to Port Hacking. Further, NSW state agencies have for decades dedicated resources to knowledge gathering in this setting.

The contemporary Port Hacking Integrated Environmental Management Plan reflects the benefit of the preceding decades of work by all of the involved parties and remains the overarching reference document.

This document allows a brief illustrated insight into the history, dynamics and challenges associated with Port Hacking.

A Bibliography on Port Hacking is available on this CD as a separate file.
THE PAST

Port Hacking lies on the southern fringe of Sydney, 30 kilometres from the city proper (Fig. 1); it is one of the estuaries that characterise the metropolitan coastline. Located between the unspoilt landscape of the Royal National Park and the surfing beaches of Cronulla, Port Hacking remains a relatively unspoilt waterway.

Port Hacking is a highly silted estuary, which owes its origin to the erosive power of the Hacking River, whose source is in the vicinity of Kelly’s Falls at Stanwell Tops, and to the subsequent drowning of the river valley.

During fluctuations in the Earth’s climate over the last two million years, glaciation on mainly the northern hemisphere caused a drop in the sea level to a maximum of 110-120 metres below the present (Fig. 2).

The Hacking River was part of the Georges and Cooks Rivers system that, flowing to the sea, cut a deep rocky valley on the inner shelf to about 6-8 kilometres east of the present shores, carrying and depositing large amounts of sediment in the process. In Figure 3 the ancient valleys of the Hacking and Georges Rivers, as they appeared 20,000 years ago, are shown as bedrock contours in metres below present sea level. Except for Osborne Shoal and Merries Reef, the valleys are now filled with sand, which extends above the water forming the Kurnell Peninsula.

![Climatic fluctuations](climatic_fluctuations.png)

![Sea level fluctuations](sea_level_fluctuations.png)
The bedrock bottom of the Port Hacking valley, off Port Hacking Point, is at about 95 metres below current sea level (Fig. 3).

Each time the sea level rose to the present height, the portion of the valley closest to the sea was drowned by marine water. The slow flooding also was accompanied by sedimentation as the marine waters, through waves and tidal currents, transported large volumes of sediment back into the drowned valley (Fig. 4). As the transport energy of the tidal flow decreases with the increased distance from the entrance to the valley the sediment is deposited in the outer third of the estuary creating a large deposit known as the tidal or marine delta.

The last rise in sea level commenced about 18,000 years ago and ended 6,000 years ago. It was accompanied by the last siltation process. Since then, the sea level has generally maintained the present position and Port Hacking has slowly assumed its present configuration.
At the same time, surface run-off following rainfall continued to carry fluvial sediments into the estuary creating fluvial deltas at the end of the Hacking River and of each sub-catchment at the heads of bays. The areas between the tidal delta and the various fluvial deltas do not receive large amounts of sediment, only some fine silt and clay (Fig. 5), and thus they maintain much of the original depth (Fig. 6). The deepest point in Port Hacking, 27 metres, is west of Lilli Pilli.
The Hacking River, with a length of 42 kilometres from its most distant source (2 kilometres west of Stanwell Tops) to Port Hacking Point, drains an area largely occupied by the Royal National Park to the south and the suburbs of the Sutherland Shire to the north (Fig. 7). Port Hacking proper is the estuary from the entrance to Grays Point where there is the delta of the Hacking River.
THE PRESENT

MARINE OR TIDAL DELTA

The marine delta occupies most of the area between the entrance and Lilli Pilli Point (Fig 8).

![Figure 8 – The marine or tidal delta.](image)

It is composed of 160 million tonnes of fine-grained sand of marine origin with local concentrations of shell fragments (Fig. 9).

![Figure 9 – Composition of the tidal delta.](image)

Radiocarbon dating of shell material from the tidal delta has confirmed the delta’s landward growth with an average rate of deposition at the delta front (dropover) of about 13,500 cubic metres per year from its initial deposition to about 2,000 years ago (Figs. 10, 11).
While a large amount of sand is present offshore, studies have shown that there is negligible input to Port Hacking by the current prevailing waves and currents. Therefore, the volume of marine sediment in Port Hacking is static (Fig. 12).
However, within the marine delta, waves and tidal currents provide sufficient energy for the redistribution of sediments in a continuous attempt to reach and maintain a condition of near equilibrium (Figs. 13 and 14).

Shoals and tidal channels are formed, slowly change and shift in response to new conditions. In recent decades this has been boosted in the attempts by nature to redistribute the sand from the middle ground shoal east of the Deeban Spit. In Port Hacking many complex factors combine to make the incoming tidal velocities (flood tide) (Fig. 13) higher, on average, than those of the outgoing tide (ebb tide) (Fig. 14). As a result, more sediment is transported by the flood tide than by the ebb tide, and so sand moves progressively upstream. It is finally deposited on the upstream face of the marine delta, at the dropovers.

Figure 12 – Energy distribution and sediment movements in Bate Bay.

Figure 13 – Energy distribution and sediment movement at the seaward face of the marine delta during flood flows.
Deeban Spit is one of the most prominent features of Port Hacking (Fig 15). In 1901-2 nearly a third of a million tonnes of sand was dredged from the side of Simpsons Bay to create access to a fish hatchery in Cabbage Tree Basin. This material was dumped in the centre of the bay, now the middle ground shoal, which is one of the most active zones of the estuary.
By the early 1920s the middle ground shoal was dividing in two and the westerly portion was being moved by waves and flood tidal currents towards Deeban Spit. Simpsons Bay was shoaling and the entrance to Cabbage Tree Basin infilled. Over the next 20 years the western movement of the middle ground shoal continued.

From 1965 to the present, Deeban Spit has consolidated its new shape, and has been raised as a result of augmentation by dredged sand. The cycle of spoil dumping onto the middle ground shoal, followed by movement of sand from the shoal to the Spit, also has been repeated (Fig. 16).

The instability of the sediment along the seaward edge of Deeban Spit creates a number of mobile sand banks (Fig. 17). The preferential direction of movement is shown by the morphology (shape) of the Spit, curved towards the west along the main channel (Fig. 18).
**Fluvial (Riverine) Deltas**

The catchment area, on the other hand, still offers ample supply of sediment. The main part of the catchment is within the Royal National Park and the sediment, carried mainly by floods, is deposited along the upper reaches of the Hacking River. Generally, this sediment consists of fine sand, silt and mud with some vegetation debris. It is deposited along the course of the Hacking River in pools and as sandbanks. During small floods much of this material is transported further downstream and deposited immediately upstream of the causeway at Audley.

However, during larger floods sediment is lifted over the weir and most of it settles out 2 to 5 kilometres below it, where it is deposited as a ‘riverine delta’ that extends from Audley down to Grays Point (Fig. 19).

As the river flow and the tidal currents are too small to carry the material any further, the ever-growing riverine (fluvial) delta slowly progresses downstream. Its present day downstream face at Mansion Point grows at an approximate rate of one metre every 12 years (or 10,000 cubic metres per year).

![Figure 19 – The fluvial delta at Grays Point. Note presence of mangroves (green) at the bottom right.](image)

Because of the length of the estuary and its configuration, the fluvial and the marine deltas, although progressing towards each other, have not met and the middle portion from Lilli Pilli Point to Grays Point retains much of its original depth, with only fine mud being deposited there.

At the same time other minor fluvial deltas are formed at the end of the many small northern tributaries of the Port Hacking (many now being confined in drains). They carry small amounts of sand and mud, which are deposited at the heads of the bays into which the streams discharge.

The rate of growth and the extent of these deltas depend on activities in, and the conditions of each catchment, such as at Yowie Bay (Fig. 20) and in North West Arm (Fig. 21).
Figure 20 – Yowie Bay. The fluvial deltas are visible at the bottom right.

Figure 21 – The large fluvial delta present in North West Arm.
ENVIRONMENTAL ISSUES

In itself, the mobility of the sediments within the tidal delta is not an environmental issue in the same way that pollutants, shore-based sediments and recreational pressures may be.

However, the ferry service to Bundeena and some recreational boating activities experience difficulties from time to time.

To alleviate these difficulties a number of dredging programs were carried out since the turn of the last century. At the same time a number of proposals have been considered to achieve a more permanent solution to the navigation issues.

One of the basic considerations is the disposal of the dredged material. The sediment was often disposed within the active zone of the Port, such as the middle ground shoal east of Deeban Spit, from where it would be redistributed by waves and tidal flows in the channels and thus eliminating any advantage gained by the dredging. In 1983, as part of the Hacking River Catchment Management Committee, an initial study was undertaken of the quality of the sand in Bate Bay and in the tidal delta (Fig. 22).

The strong similarity between the sand in Bate Bay and in the mobile portion of the tidal delta suggested the suitability of the dredged sediment as source for the nourishment and protection of the beaches along Bate Bay. The present disposal (Figs. 23-26) confirms such suitability.
Figure 23 – The dredge vessel off Cronulla.

Figure 24 – Dredge fully loaded approaching the disposal site.

Figure 25 – Unloading the sediment.
The section of the tidal delta further away from the seaward end may require a different location for the deposition of the dredged material and the dropover areas are generally suitable.

**The Ballast Heap**

Located off Little Turriell Bay on the south side of the main navigation channel, this unique feature is a historic landmark linked to the shell gritting industry during the early stages of growth of Sydney. It was created in the early 1850s by unloading ballast ‘stones’ from small sailing vessels prior to loading shell grit (Fig. 27) and transporting it to Sydney for burning into lime. The ‘ballast heap’ is made of sandstone blocks stacked in line along the side of the channel for a length of 60 metres and with a width of about 10 metres.
The Aquatic Environment

Amongst the major elements of the aquatic environment of Port Hacking are the three vegetative habitats important to the productivity of the estuary. These habitats are characterised by seagrasses, mangroves and saltmarshes (Fig. 28).

The three different habitats are colonised by distinct floral and faunal communities. However, they function similarly as areas of primary food production where sunlight and nutrients are converted into organic material. This material is then used in the estuarine food web. The vegetative habitats also provide sheltered and stable areas for juvenile and adult estuarine species. A wide range of organisms, from birds to fish to encrusting algae, benefit from the food and shelter provided by these habitats. Of the three vegetation types, seagrasses occupy the largest area within the Port. A total of 87 hectares is covered by three species of seagrasses (Fig. 29).

Seagrasses are aquatic plants adapted to life in the marine environment (not seaweeds) and most species consist of rhizomes and strap-shaped leaves. Their distribution is determined by light, salinity, wave action and many other factors. The main seagrass area is situated at the eastern entrance to South West Arm.

Figure 28 – The distribution of the major elements of the aquatic environment.

Figure 29 – Seagrasses: (A) Posidonia australis, Zostera spp. and Halophila spp. (photo R.J. West).
Seagrass beds are an important component of the marine environments, as they have an important role as fish nurseries and hatcheries. They occur in stable shoals, and are regularly distributed from one shallow area to another. Their presence is an important factor in maintaining the stability of the shoal itself and in minimising sediment movement.

Changes in the seagrass cover of the shoals of the tidal delta over the period 1930 to 1983 indicate that the extensive seagrass beds that existed in this area in 1930 and 1951 were progressively destroyed by the shell grit mining carried out from the late 1920s up to the early 1960s. Regrowth of seagrass beds has occurred since the shell grit mining ceased in 1973, however the extent has not yet reached the pre-mining levels (Fig. 30).

Two species of mangroves occupy a total of 33 hectares (Fig. 31), but saltmarsh only covers a total of 11 hectares, and this is mainly in Cabbage Tree Basin.
Other aquatic habitats also are important even though they do not provide the same amounts of organic material. They include mudflats, rocky outcrops, and open water. Most importantly, these habitats are all highly interrelated making the aquatic environment a single dynamic unit. This means that any change in one habitat or area will have some effects elsewhere in the Port.

Amateur recreational fishing and other water-related activities are very popular within Port Hacking. The Port is easily accessible and in close proximity to the city of Sydney and to the large population catchment in Sydney’s southwest. The waterway is almost solely reserved for recreational activities as the major portion of the estuary (west of Hungry Point) has been closed to commercial net fishing since 1902.

The conservation of the Port and its adjacent environment is an important issue and efforts to address it began in 1879 with what is now the Royal National Park. In 1967 the beds of Cabbage Tree Basin and South West Arm and the Hacking River upstream of Grays Point were added to the Park for protection. The Park’s foreshores and waterways offer a wide range of activities from simple exploration by individuals to study by educational and scientific groups.

**Shiprock**

Shiprock, a deep submarine cliff (Fig. 32), is also a unique recreational and educational feature of the Port. It was declared an aquatic reserve under the Fisheries and Oyster Farms Act in March 1982.

It is named after a prominent ship-like rock off Little Turriell Point, the west headland at the entrance to Burraneer Bay. Strong currents and the cliffs’ topography have prevented the deposition of large quantities of sand, typical of the tidal delta, leaving a relatively small but deep environment that is covered by a rich growth of marine invertebrates (Figs. 33, 34) and attracts large numbers of fish as well as divers.
Port Hacking also has been a site of scientific research by scientists from many universities, including CSIRO’s Divisions of Oceanography and Fisheries that was stationed at Hungry Point until 1985. The site is now occupied by the Fisheries Research Institute of the Department of Agriculture. Scientists of the Institute and various universities will continue to study Port Hacking to further understand the estuarine environment.

Figure 33 – Ceratostoma amoenum (a nudibranch).

Figure 34 – Chromodoris daphne (a nudibranch).
Pre 1788

Anthropological and archaeological studies date human settlement at Port Hacking for some 8,000 years. Human occupation of the continent has much more ancient confirmations in so many other parts, and on the coast of NSW Aboriginal sites at Burrill Lake have been dated at 20,000 years. One can only speculate that the evidence of much earlier occupation lies submerged in the drowned valley and shores. Also, the soils of the area are not conducive to the preservation of relic material.

The people around Port Hacking were of the Dharawal Language tribes that extended from Botany Bay to the Shoalhaven. Within the Dharawal group were smaller tribes with their own territory. The Gweegal were the tribe that occupied the areas around southern Botany Bay and Port Hacking. The Aboriginal history of this region is of importance because it is the site of the arrival (for settlement) of Europeans, and the contacts between the first British arrivals in this area are the best documented in the continent.

There has been a significant history of archaeological discovery and study in the Sutherland Shire, and around Port Hacking. Many of the recognised sites have been degraded through modern contact and development. Nonetheless, Port Hacking and its catchment still contains much archaeological evidence of Aboriginal occupation in middens, rock engravings, rockshelter and open campsites, tool making grooves and other features (Fig. 35).

The area we now refer to, as Port Hacking was known to the Dharawal People as Deeban.

Understandably, the most easily identifiable archaeological relics occur in the areas of the least European disturbance, in particular in what is now the Royal National Park. There are well recorded examples of rock art, painting, tool making and burial sites. Some of these sites may be viewed freely.

However, despite the developed character of the northern foreshores, there have been some recorded studies and events, as well as some remnant material. Predictably, those areas that provided easy access to the waterway or provided meeting area or shelter have provided much of the historical record. Development has erased much, but scientific studies were carried out, and there have been disputes between landowners and authorities, and between landowners over protection and the right to develop on sites. Amateur historian Frank Cridland wrote in his book, “The Story of Port Hacking, Cronulla, and the Sutherland Shire”, referring to Cronulla:
“No part of Port Hacking shows more evidence of continual aboriginal habitation…. They left behind some very fine rock carvings cut with remarkable fidelity and proportion to life. …The flat rocks on the Gunnamatta side of the Point are exceptionally rich in this respect. The Burraneer Bay side is, no doubt, still rich in these treasures, for some of the private properties contain great mounds of half-decomposed shell and other debris…. The aboriginal history of the shire is retained in the names of some of the neighbouring places. These include Gymea, Burraneer, and Gunnamatta.”

A fascinating story reported in 1918 was retold in the journal “Dawn”, July 1968, and may well be the worst tragedy in terms of human life in and around Port Hacking.

“Under the heading “Century-old Tragedy Revived - Strange Lightening Freak” the paper reported:

“Mr Henry Simpson, boat proprietor, Tyrell’s Point, Port Hacking, has made a discovery of historical interest…..According to the story, about 130 years ago there was a large gathering of the tribes from all parts of the South Coast at this particular part of the bay, as it was a shallow crossing. A violent storm came up and the natives took shelter under the overhanging rock, which was struck by lightening and collapsed”. According to the paper Simpson conducted a number of excavation recovering evidences of this human tragedy.

As early as June 1899, other men had heard about the Aboriginal legend. A Mr Walter R Harper mentioned the tragedy in a paper……” local tradition points to “Tyreal Head”..and says that there was the great crossing-place of all the South Coast inhabitants on their visits to the north. Near at hand is a great cave, the roof of which fell in” with considerable loss of life. That Port Hacking must have been a favourite camping ground of the aborigines…is proved by the number of rock shelters, or, as they are locally styled, ‘gunyahs’, along its shores”.

The story is believed to be confirmed through discoveries made in 1987 during waterfront construction at the location, and the shelter has been named “Biddy Giles Shelter”, after the custodian of the oral history of the event.

The impact of the Aboriginal inhabitants was therefore totally unobtrusive. From 1788, however, the human activities are of great impact.

**After 1788**

Port Hacking owes its name to Henry Hacking (c. 1750-1831), a first fleeter and Quartermaster on **HMS Sirius**. European discovery is attributed to James Aiken, a seaman on **HMS Supply**. Aiken is reputed to have sighted the estuary while seeking water for the First Fleet while anchored in Botany Bay.

The area accordingly was first known by his people as Port Aiken.

When Bass, Flinders and the boy, William Martin, entered the Port on their first voyage of coastal discovery in the **Tom Thumb**, they took soundings of the inlet. Those soundings remain on record and help today (along with a later Royal Navy survey in 1851) to confirm hypotheses about the dynamics of the estuary sands.

‘April 1st, (1796) was employed in the examination of the Port...it is something more than a mile wide in the entrance; but soon contracts to half that space, and becomes shallow. Neither have the three arms into which it afterwards branches out, any deep channel into them; although, within the second branch, there are from 3 to 8 fathoms. Finding there was no part accessible to a ship, beyond 2 miles from the entrance Port Hacking was quit early in the morning of 2nd April.’ from **A Voyage to Terra Australia 1814** by Matthew Flinders.
Bass and Flinders on that voyage named the area Port Hacking after First Fleet quartermaster Henry Hacking. Hacking had earlier indicated its existence to the explorers but played no role in the exploration or any other aspect of Port Hacking. It is therefore confusing since the name by which the area was popularly known was still used until much later in the 19th century, when the name Port Hacking became used exclusively.

During the early part of the 19th century, settlement occurred in the catchment area, and on the northern and southern foreshores of Port Hacking, although there was little development. The principal activities were fishing, timber getting, and grazing. As early as 1806 there is record of a quantity of 13cwt of fish arriving in Sydney, ‘the whole having been procured at and about Port Aikin in the space of eight days’.

Also among the very early interests in the Port was shell gathering. The colony needed lime for mortar for construction and the shell provided the base calcium carbonate. There are several modern place names in and around Sydney that carry the record of lime kilning associated with this early activity. However, there are also records of some kilning on the southern shores of Port Hacking, such as the ballast heap (Fig. 27).

Overall, these activities were low-key but already there was soil disturbance, with the consequential increased sediment inputs to the waterways, and some tinkering with sediment dynamics of the estuary.

Fishing appears to have been the earliest commercial activity, and progressively oyster gathering and later oyster farming would be important. They remained small scale when compared with activities that developed in other estuaries. Indeed, it appears that activities in Port Hacking were little more than subsistence on the part of itinerant workers.

The virgin forests offered a variety of useful and attractive timbers. From very early days areas logged included what was later to become the Royal National Park. So scant was activity in, on and around Port Hacking that, in respect of early settler Charles Goggerly (1854), Captain William Collin reported in 1856 that Goggerly and his family were the only ones living at Port Hacking. In this context, it may be assumed that the term ‘Port Hacking’ referred to the area between Burraneer and Lilli Pilli rather than the entire estuary. Indeed in modern times that area carried the name Port Hacking as the name of the suburb.

Goggerly’s cottage at the point (now in the National Park) that now bears his name is one of the earliest buildings in the Sutherland area. Goggerly was later to be involved in a boating tragedy on Port Hacking.

Major acquirers of land around Port Hacking were Thomas Holt, John Connell, and Patrick and Dominic Dolan. Each of these people was to be involved with significant land clearing and later sub-division.

The more the settlers did around Port Hacking, the more the need arose for things to happen. Land was cleared for animals, houses sprang up, tracks were cut through, and eventually a railway. The line to Waterfall opened in 1886.

The village of Bundeena began life as the Yarmouth Estate, or Byrne’s Bush after an earlier grant of 400 acres to Owen Byrne was subdivided in 1886. At Bonnie Vale, William Simpson acquired 50 acres in 1863, and the house later became Simpson’s Hotel. Bundeena and the hotel were served by launch from the northern side, 1915 for Bundeena from Gunnamatta and 1916 for the hotel from Turriell Point.

By the end of the 19th century and in the early 20th century there were numerous residential subdivisions, and increasing recreational use of the waterway (river and estuary) and of its northern and southern foreshores.

The Sutherland Shire was incorporated in 1906. At that time, the population of the area was about 1500. Shipping to Port Hacking has for a long time been misrepresented in local lore, somewhat caught up in the dredging debate of later years. Anecdotes abound that ships calling to Port Hacking for timber and shell grit, were substantial oceanic cargo ships. More than likely these ships were trading ketches, and necessarily of shallow draught. Larger ships, however, did call.
The township and district of Cronulla were now open for communication by sea. Hitherto coastal vessels have not been able to call comfortably at the beautiful, but awkwardly situated seaside resort. This was remedied by a substantial wharf, built by the Shire Council at the southern end of the picturesque Hungry Point at which practically any coastal steamer may berth (Fig. 36).

The wharf extended 362 feet (more than 100 metres) into the Port at what is now known as Salmon Haul. Because of the exposure to ocean swells, service was unreliable, profitability fell and the service finally ceased in 1924.

Public transport had opened up holiday opportunities and the first dredging of Port Hacking took place in 1881 to provide the ferry route to Audley. By the 1920s the scope of recreational waterway use had expanded, and dredging started to include the Gunnamatta channel. Even so, development around the waterway remained relatively sparse. Gunnamatta Bay, and more especially Yowie Bay, were focal points for holidaying and recreation on the northern shore.

The Sydney gentry also had made Port Hacking a weekend and holiday playground. Many grand properties hosted the rich and famous. *Moombara* on Little Turriell Bay hosted Dame Nellie Melba, the Governor-General of the day, royalty and nobility. Photographs of the time show a very English style of gracious leisure ashore and on the water.

A historically important settlement arose as a result of the great depression. Because housing and accommodation was unaffordable for the unemployed, squatters built shacks at Bonnie Vale, as they did at other places in and around Sydney. Some of these shacks remain although some may be now unrecognisable and there has been a controversial National Parks and Wildlife Service program for their removal.

A major shift in emphasis from recreation to residential around Port Hacking occurred after World War II. This was facilitated by the transport and other services that holidaying in the area had brought about, but driven mainly by land prices being cheaper than in the suburbs closer to the city. Significant population changes began to occur with the corresponding increase in the amount of land used for urban purposes. The Shire’s small isolated rural type settlements quickly became thriving suburbs. The Housing Commission resumed vacant land close to railway stations for its developments, while thousands became ‘owner-builders’. One of the limitations on the size of dwellings, other than the restrictions of income was the unavailability and rationing of building materials. So much was the scarcity after the war that official limits were placed on the size of dwellings.
From the 1960s onwards, the waterfront and foreshore of Port Hacking became the focus of expensive housing. However, the absence of technology and cost together kept development to the more easily accessed and workable sites and the size of blocks remained large enough to retain a sense of open space with development. This also meant the greater likelihood of retained vegetation.

However, vacant waterfront land had become scarce, affluence had increased and technology was available for larger scale development on difficult terrain. Steeper and more difficult sites were now exploited for increasingly larger houses with the attending major modifications to the natural landform.

Sydney was expanding everywhere during this time. The major growth areas were in the west and southwest, especially in the Liverpool and Campbelltown region. Population growth in that region became significant for Port Hacking because, along with the Illawarra, Cronulla and Port Hacking were the most accessible seaside and waterway recreational opportunities. Cronulla still remains the only Sydney beach suburb served by rail. The south-western region became part of a now huge recreational user catchment for an attractive and diverse recreational resource.

During this period the sand that had infilled Port Hacking over thousands of years took on an important significance with the shallows off Lilli Pilli being used as a recreational area (Fig. 37).

During the 1980s some of the users of some watercraft were pointing out the inconvenience caused by the shoals. There is no record of the marine delta ever having closed access to the sea and the ‘inconvenience’ was for the deeper draught vessels having to wait for the tide. Secondly, there was an increasing expectation to use deep-keel craft, as is the case in nearby metropolitan deep-water ports, such as Sydney and Pittwater. In other words, vessels, which could not navigate the tidal waters at low tide, were increasing in numbers.

The first dredging took place in the latter part of last century to keep the ferry route to Audley open, and has continued ever since.

In the late part of the last century The Basin, the lagoon and surrounds between Cabbage Tree Creek and Port Hacking proper, was chosen as a site for a fish hatchery. The idea of a fish hatchery had earlier been pursued in Port Hacking, but had failed partly because of the attempt to grow northern hemisphere cold

![Figure 37 – Recreational activities on the Lilli Pilli shallows.](image-url)
water species. It was the impact of an outbreak of bubonic plague in Sydney that gave impetus to the project in Port Hacking. The hatchery was transferred in 1907 from The Basin to the present Fisheries Research site at Hungry Point.

Other significant conservation events in this era were the closure in 1902 of Port Hacking to net fishing, and later the protection of some unique environments. The Basin and South West Arm were given protection under the powers of the National Parks and Fisheries, and added to the Park in 1967.

Today, The Basin contains an area representative of a whole range of estuarine environments: saltmarsh, mangroves, tidal mudflats and seagrasses. It is also significant for its large colonies of soldier and fiddler crabs. Threatened bird species also are known to appear there.

Dredging gave temporary relief but over time turned out to be a double-edged sword as on many occasions the dredging spoil was deposited so that it soon added to the sediment load being moved by nature around Port Hacking, adding to the instability of navigation channels.

Storm events also caused quick changes to dredging outcomes and to the position and depth of channels.

As mentioned earlier, the sands in some areas in Port Hacking have a very high shell content and mining on a larger scale began in 1928 and continued until 1973. The mining was carried out on the tidal flats on the southern side of Port Hacking, off Maianbar. Shell grit in these later years had assumed a value in the poultry industry. The sands of Port Hacking have been the subject of great mythology. It has long been believed in the community that the moving sand in Port Hacking was originating at the ocean beaches. The belief was held that storm-eroded Cronulla beaches were the source of the sand that kept filling in the channels. It was also common belief that the marine shoals have a modern terrestrial origin and that the sand has come from urban development.

Science proved otherwise, but some of the misconceptions remain today.

Dredging, sediment disposal and shell grit mining have had an effect on the stability of the shoals and channels, and affected the seagrass beds.

Population growth and increasing affluence brought with it an explosion in recreational pursuits. The number of people using the waterway increased dramatically during the 1980s but more so in the 1990s in absolute terms. The numbers and types of watercraft increased commensurably.
As consequences of the recreation explosion, launching ramps grew and the use of them intruded into the residential amenity. The larger boats need mooring, and the more protected bays and those close to the sea became mooring-congested. Sleepy boat sheds, which years before had hired out rowing boats, became marinas, and slipway and boat maintenance activities increased to service demand (Figs. 38, 39). Bigger boats have toilets, galleys and bilges. The expansion in boating brought with it increases in threats to the waterway from substances associated with boat use, boat protection and boat maintenance.

Recreational pursuits became more diverse and innovative. Casual canoeing led to large scale and organised kayaking, sailing grew, sailboards appeared, little runabouts proliferated, often with oversized motors, and personal watercraft appeared.

Angling, snorkelling and scuba diving all exploded in popularity. Water space, foreshore space and access opportunities were now the subject of competition, and of user conflicts.

The Royal National Park

A landmark event was the dedication of the National Park in 1879. The ‘Royal’ status was not granted until 1955.

The dedicated area of 18,000 acres included all remaining land on the southern shores of Port Hacking. An enlightened move for its time, the wider significance of this act would be realized and appreciated many years later. The size of the Park is now approximately 64,000 acres.

Initially, the Park was a place for pleasure: a venue for picnics and socialising. The early approach to management transformed Audley with manicured parks, gardens, lawns, lakes and aviaries. To complete the European setting, deer were introduced. Additionally, the Park then was afforded few measures of protection, and extractive exploitation was allowed to continue.

Later, and perhaps of larger importance, was the establishment of bushland with multiple values, such as recreation, conservation and preservation – the aesthetic contrast to the built form of the completely developed northern foreshore, and the protection of about 90% of the Hacking River catchment. Interest groups, such as bushwalkers, achieved significant expansions into the Park.
A persisting popular misconception is that the bushland of the Park is pristine, punctuated only by the villages of Bundeena and Maianbar and the Church of England camps of Rathane and Telford. In fact, it is far from pristine around the waterway. Along many parts of the foreshores from Maianbar to Audley are the remnants of buildings and waterfront structures and the legacy of introduced vegetation.

Development around the Park’s foreshores was, in the main, holiday related. In the late 19th and early 20th centuries recreation was as active on the southern shores as it was on the northern (Fig. 40).

Timber was logged in various places throughout the Park. The earlier logging took place in areas that then were not declared part of the Park. The Trustees and conservationists fell into dispute in 1922 as a result of logging for mine pit props.

‘The dispute is of historical importance because it marks the first major conservation battle fought in Australia, and demonstrates the influence the new conservation groups had gained. It not only produced government intervention, but had the wider impact of altering government attitudes towards nature generally.’ (Slade, 1985).

Later, during World War II, timber was extracted from dedicated National Park. The size and configuration of the Park was not always the size and configuration that it is now. It grew in increments, and was added to in stages. Tracts of the foreshore were transferred from freehold title. The additions were not always in a virgin or pristine state. Houses and foreshore structures dot most of the southern shoreline, along with attendant non-indigenous plantings. Many physical and vegetation remnants still exist.

A detailed case study of early development on the southern foreshore was carried out (D. Cashmere, Research Report “Costen’s Point”, Historical Archaeology III, U. Syd) and serves to explain the remnants that remain clear to this day and serves as a valuable case study of early European activity. Costen’s Point owes its name to Dutch immigrant seaman William Costen. Costen is recorded as owning the initial 40 acres land grant of 1870. This was expanded to 65 acres and remained a private holding even after the establishment of the Park. The holding covered the waterfront from Redjacks west to Gooseberry Bay.
Costen built a dwelling for his family, but there are 6 distinct building sites. The waterfront remnants suggest that Costen provided services to local shipping.

The shoreline still shows extensive activity such as piers and wharves, boatshed, ramps, land reclamation and a deep-water dock (as well as swimming enclosure). Cashmere speculates that the facilities may have been part of Costen’s business that later may have lapsed to leisure.

While the dedication of the Park locked out development and would forever provide Port Hacking with its beautiful southern foreshore, things happened outside the Park in this period that seriously threatened the viability of the Hacking River and certain sections of the Park.

**The Catchment**

The catchment of the Hacking River is an important influence on the estuary and cannot be disassociated from it. It is the area from which fresh water and its sediment load is conveyed to Port Hacking.

The township of Helensburgh with its garbage tip, coal mine and coal washing, the Princes Highway, farms including piggeries, the unsewered Garawarra Hospital and horse riding establishments all fell within the catchment and influenced the river. The river was given strong protection in legislation, but at the same time was under serious attack from many elements.

Pollutants were leaching out of the garbage tip into the river. The fine material from coal washing carried into the river. Horse urine concentrations in the river water would reach levels so high in dry spells as to be toxic to native fauna. One road crash on the Princes Highway is believed by authorities to have put an end to the river’s platypuses. Increased nutrient loads caused other problems for the watercourse, as did the construction of weirs.

Power boating on the lower sections, which is below Audley, has eroded the soft banks.

Wildfires have long been a part of the Australian bush. The incidence and magnitude of wildfires are believed to have increased significantly in the period after European settlement. One of the hidden consequences of fires is the availability of soils to be eroded before revegetation occurs. Rain after fires loads the river with sediment that ordinarily would be contained by vegetation. The abnormal sediment loads can occur for 12 months after a fire. Tracks to facilitate fire fighting contribute to the sediment load.

Many of the major storm watercourses and outlets into Port Hacking were, of course, once streams and creeks. Watercourses have catchments and deltas. The catchments for these watercourses lie in areas that progressively went from virgin bush to primary land clearing and farming, to excavated developed and populated urban environments. Absorbent surfaces were replaced over time with impervious surfaces increasing the volume of surface run off.

As development increased the levels of material carried by these watercourses became high, consisting not only of soils and clays, but later also gravel, road base, other materials associated with building, road and rail construction. The magnitude and make-up of the deltas changed. The results are now highly degraded heads of the major bays of Port Hacking, with rehabilitation difficult and expensive.

During the course of European governance the number of authorities and administrations had grown. Sutherland Shire Council had responsibility for a large part of the Hacking River catchment and the foreshore of Port Hacking. The Department of Crown Lands would own the tidal area and below. The Maritime Services Board controlled boating and navigation. Public Works carried out the colony’s or state government’s works responsibilities. The National Park has its own laws and administration. The state government had control through other departments for fisheries, highway, rail, water and sewerage, police and more. The list of controlling authorities grew to about 30 in total.
As justifiable and useful each and every authority may have been, the sheer number and overlapping areas of responsibility militated against the facilitation of the management of growing environmental and social pressures.

The population explosion that began in 1945 plateaued by 1980, when the population was about 160,000 (Fig. 41). The 1980s were a landmark period because from that time human impacts entered a new era of understanding and due to perceived unsustainability of trends in recreation demands and foreshore development authorities, planners and researchers started to investigate concepts of sustainability and integrated management.

Through the 1980s and 1990s boats had become more numerous and had become, on average, larger. Navigation within the Port had increasingly become the subject of complaint by the owners of the larger boats. The shoals were consistently referred to as a problem. Periodic dredging was seen not to be cost-effective.

Sand mining was proposed repeatedly as a means of reducing the shoals. The Cronulla (Wanda) sand hills had been Sydney’s principal sand supply for the construction industry but by the 1980s the lifespan of this supply was seen to be limited. Alternate sources around Sydney started to arouse serious interest because sources from farther afield had the disadvantage of transport costs. Quite naturally, the industry’s eyes turned towards Port Hacking on more than one occasion. Investigation of proposals quickly established substantial cost and environmental limitations.

The problem was never really defined or analysed. In reality, the problem was that the naturally shoaled waterway (albeit aggravated by interference) did not suit some recreational pursuits for some users.

With hindsight, the shoaled nature of Port Hacking was its saving. Had Bass and Flinders reported a deep port accessible to ships, it is highly likely that the eastern part would have been developed as a commercial port of some kind, with associated industry and shore-side infrastructure.

As public demands increased for a solution, governments at local and state level and different elements in the community began to recognize the need for a new and more involved means of managing the impacts and problems associated with human involvement on and around the Port.

Sydney’s population had continued to grow and urban expansion in the Hacking’s catchment continued. With this new wave of development was a loss of native trees and of absorbing surface, replaced with impervious surfaces, new and often exotic planting.
Wollongong City Council proposed major urban development at Helensburgh, in the Hacking catchment, only to have it blocked by powerful argument and community resistance.

During the 1980s, and especially into the 1990s, the magnitude of foreshore modification increased dramatically. The diminished availability of highly valuable waterfront land in particular was now pushing development to limits previously not envisaged. Multi-tiered mansions climbed previously inaccessible slopes on the foreshore. Planning codes were revised to try to preserve some of the aesthetics of the foreshore and to minimize other environmental impacts.

In 1984 Sutherland Shire Council began work with a project that was in most respects unique. Council’s target was to produce a plan of management for the Hacking, the total catchment and the waterways. This project was novel because of the joint involvement of community, local and state governments and because of the philosophy of bringing together all components of the waterway under a broad planning umbrella. The concept of integrated management had been established.

Environmental protection had begun early with a ban on commercial netting for the most part of Port Hacking in 1902 and increased much later with certain closures within the estuary, such as spear fishing and shellfish gathering. The unique sea floor features and marine fauna and flora at Shiprock (Turnell Point) were given protection by dedication of the area as an Aquatic Reserve in 1982.

Issues like water quality became serious community targets. Urban pollution, poor sewerage infrastructure and impacts from development added to the list. Urbanisation had now been seen as having significant impacts on the waterways, such as pesticides, domestic refuse, silt, oils, rubber particles, and heavy metals.

For the first time, environmental threats to Port Hacking are seen to exist from offshore. There was a growing awareness in science of the transference of marine organisms in the bilge water of ships. The opening of Port Botany as Sydney’s major commercial seaport resulted in ships anchoring in Bate Bay. A more violent threat was to be realized when a large vessel was blown ashore on Wanda Beach. Although eventually refloated without mishap, the incident could well have devastated Port Hacking. For some, this was a serious warning, but ships continued to anchor well within Bate Bay.

The pressures were all too obvious and started to shift social attitudes and values. Sandy shoals once considered a problem by some started to become a recreational resource as overcrowding pushed users from established locations (Fig. 34).

A consciousness was developing about the unsustainability of some practices, and the style and magnitude of development brought into focus the aesthetic and intrinsic values of the environs.

Community participation had been embraced in the 1980s, but it took some major events to trigger community activism. A proposal for major engineering works as a “permanent solution” to the shoaling “problem”, issues in the Royal National Park, urban expansion proposals in the Hacking River headwaters, high-rise construction in Cronulla, offshore sand mining proposals all in their own way mobilized various sections of the community.

While the local boating community was pressing for dredging, there was also the political pressure from the poor cost-effectiveness of the traditional approach. One of the recurring issues was the disposal of the dredged spoils. The Public Works Department’s studies and deliberations in the early 1980s on the issues associated with the shoals gained some momentum that received a huge boost by the adoption by the then state government of its Better Ports policy. This policy was aimed at port improvements for commercial and recreational purposes. Palms had become the planting fashion of the 1980s and 1990s.
Work by the Public Works Department climaxed in 1986 with its Port Hacking Marine Delta Management Options study. This was a paper that put forward a series of options along with the costs, benefits and negative impacts. Its preferred option was:

‘A very different alternative would involve the creation of a tombolo, or sand breakwater, projecting northwards off Cabbage Tree Point (Bundeena) projecting northwards for some 500 metres. .......The tombolo would be created by progressively dumping about 400,000 cubic metres of sand, the head of which would be protected by rock..... approximately 10,000 tonnes of rock would be required.....sand for the wall would be taken from the channels leading into and across the mouth of Gunnamatta Bay, from the channel off Burraneer Point, and by the general deepening of Simpsons Bay. In this way a 50 hectare area of sheltered water between 3 and 5 metres deep would be created in Simpsons Bay.’ (Fig. 42).

Supporters were excited by the prospect of permanent navigation and deeper water. Opponents were concerned about the aesthetics, adverse physical and biological impacts, and the fear that the real motive for the works was to create a capacity for large marinas in Port Hacking.

An Environmental Impact Statement did nothing to ameliorate protest. If it achieved anything, it further fuelled concerns about adverse impacts on Port Hacking. In the end, the Public Works Department abandoned the proposal. With the 1990s came an age of environmental enlightenment, knowledge and understanding for the wider community. Television documentaries gave graphic and explicit insights into the workings and wonders of the natural world. Many of these presentations included warnings of environmental pressures and the probabilities of permanent human-caused changes to climate.

THE PORT HACKING INTEGRATED ENVIRONMENTAL MANAGEMENT PLAN

The Issues
Perhaps the greatest philosophical change in planning circles was the recognition of the Hacking as a total entity, that the catchment is inseparable from the estuary, and the physical, biological, social, recreational and urban components are part of a whole, all inter-related and inseparable (Fig. 43).

Urban consolidation became law in an attempt to contain Sydney’s sprawl. For the Sutherland Shire this meant an explosion of medium density development and the attending further increase in population. Older or smaller houses on traditional quarter acre blocks became targets for this development.

In the wake of the tombolo proposal the then Minister for Public Works, saw the indefinite financial commitment involved with dredging as it was, and attempted to shift the cost burden to Sutherland Council. The Council deftly opposed any shift in responsibility, and the state government terminated dredging.

In 1994 a Memorandum of Understanding (MoU) was struck, which set the strategy for ongoing maintenance dredging. This was intended to bind all the interests to a set of principles under which dredging would take place in the future. One if its aims was to provide environmental safeguards and sustainability. Another aim was to address some of the issues that give rise to demand for deep-water navigation. A third objective was to achieve some equity in the provision of public funds on and around the Port.

Importantly, the MoU became the legal basis by which any future dredging would be funded by the state government.

State and federal governments in this era had taken major environmental and planning initiatives. The most significant of these, especially in terms of having some impacts on public awareness and some form of action, were: Total Catchment Management, NSW Coastline Management Policy, creation of the Coastal Council, Coastcare, Bushcare and state-driven storm water management funding. Seagrasses, mangroves and saltmarshes have been given protection under law. Polluting discharge from boats has had restrictions increased.

Scientific warnings began some decades ago about the consequences of global warming. One of the consequences is a rise in sea level. Scientists may still debate the magnitude of such a rise, but there is almost unanimity that a rise in sea level is happening with consequences for the estuary, the foreshores and the catchment.

The Port Hacking Integrated Environmental Management Plan aims to address contemporary challenges and to allow planning and management within a modern estuary management framework.

Some of the key elements include the following:

- Building and construction practices have been improved to contain sediments.
- State/local government programs have gone a long way to contain solids pollutants from the waterways.
- Boating-related inputs to the waterway have been regulated shore-side and on-water.
- Dredging of navigation channels is committed to set depths with offshore (beach nourishment) disposal whenever possible.
- Building codes have been redesigned to minimize foreshore impacts.
- Competition on the waterway for recreational pursuits is more intense than ever, and user conflicts on and for the water continue. Equity of opportunity remains a management challenge.

The capacity of popular boating anchorages, such as Jibbon Beach, has pushed use to other areas and converted previously “nuisance” shoals to recreation sites. The incapacity of a fully developed and steep urban foreshore continues to effectively limit expansion of shore-based boating facilities and infrastructure. Demands by landholders for foreshore facilities, such as pontoons and poles, continue to grow against needs for constraint.
Planning and management was now seen to reflect the need for integrated management (Fig. 44). The shoaling issue gave some momentum to the formation and early work of Council’s Port Hacking Planning and Advisory Committee (now the Port Hacking Management Panel).

After some years of work by this committee, Sutherland Shire Council had produced a Plan of Management in the late 1980s, which was formalized in 1992. This plan was a trailblazer in the concept of integrated estuary management.

Despite the very real value of the work, this plan failed to be actively promoted and Council and the state government authorities were generally slow to provide tangible support to achieve real outcomes. Some important achievements did come out of it, but even some of these did not occur within expected time objectives.

Pressure remains on the Port’s ecology. Seagrasses remain vulnerable, as do protected areas, such as The Basin and the limited saltmarsh areas.

The visual amenity of the Port continues to diminish through the removal of indigenous vegetation and by the substitution by exotics, such as palms. Heads of bays remain degraded through the sedimentation caused by bad land practices of the past.

Opportunities for public access to the urban (northern) foreshore remain limited. The biophysical and biochemical science of Port Hacking is still in need of further research and understanding. The global events, such as sea-level rise, place an increased pressure on the present management strategies as water flows may be altered with consequent redistribution of mobile sediment.

Figure 44 – Planning and management sequences.
250-206 million years (Triassic Period) – The laying down of the sedimentary rocks to be later uplifted and eroded into the modern topography.

1.8 million to 18,000 years ago (Quaternary Period, Pleistocene Epoch) – The present coastal features are developed. A number of ice ages with consequent sea-level fluctuations from -120 metres during ice age and present level during an interglacial age.

18,000 to the present (Quaternary Period, Holocene Epoch) – The sea level begins to rise as the Earth begins to warm out of the last great ice age with the flooding of the Hacking River valley and infilling of sand, thus creating Port Hacking.

8,000-6,000 BC – Human settlement by the Dharawal people.

5,000 BC – Rise in sea level reaches present level.

1788 – Europeans see Port Hacking and the name of Port Aiken is given.

1796 – Bass and Flinders explore Port Hacking, and name it Port Hacking after First Fleet pilot, Henry Hacking.

1851 – Royal Navy hydrographic survey of Port Hacking.

1856 – First release of Crown Land between Port Hacking and the Woronora River.

1879 – Royal National Park dedicated 18,000 acres.

1880 – Royal National Park extended to 30,000 acres.

1881 – First dredging of Port Hacking.

1883 – Engineering works in Hacking River to improve navigability.

1886 – Railway goes through to Waterfall.

1901 – 300,000 tons sand deposited on middle ground shoal to develop fish hatchery at The Basin.

1902 – Commercial netting closure for Port Hacking.

1906 – Sutherland Shire Council created.

1907 – Fisheries transfers to Hungry Point.
1908 – Village of Gunnamatta changes name to Cronulla (Gazette Notice Feb. 2).

1915-6 – Ferry service to Bundeena and Simpsons Bay commences.

1919 – Official opening of the ocean wharf.

1924 – Ocean link between Sydney and Cronulla ceases.

1928 – Shell grit extraction begins.

1967 – The Basin and South West Arm given protected status.

1973 – Shell grit extraction ceases.

1980 – Public Works Dept. commences hydraulic studies re shoaling.

1982 – Unique marine and seabed features at Shiprock given protection as Aquatic Reserve.

1984 – Sutherland Council commences study for plan of management, driven by shoaling issue.

1986 – Public Works Department produces its preferred option for Port Hacking (the Tombolo).


1994 – Memorandum of Understanding struck to set the terms for dredging.

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