APPENDIX I

NAUTICAL RECKONING OF DATE AND TIME

There are two matters concerning date and time to be considered when reading the original ship’s log:

1. **Ship’s time by nautical reckoning:**

   British sea captains, as was the custom during the 18th century and early 19th century, quoted times in their ship’s logs by nautical reckoning, whereby each day commenced at noon. Each day, when the observed sun was at its zenith, it was more-or-less on the meridian of the observer, and this corresponded to local noon, if we ignore the Equation of Time (a measure of the difference between the observed sun and the mean sun).

   **Example for ship’s log of a ship arriving from the west:**

<table>
<thead>
<tr>
<th>MURRAY'S SHIP'S LOG (SHIP'S TIME) 1802</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun 31/1     Mon 1/2     Tues 2/2    Wed 3/2    Thurs 4/2   Fri 5/2   Sat 6/2   Sun 7/2</td>
</tr>
<tr>
<td>pm           am          pm          am          pm          am        pm        am</td>
</tr>
<tr>
<td>Sat          Sun 31/1   Mon 1/2     Tues 2/2   Wed 3/2    Thurs 4/2  Fri 5/2   Sat 6/2   Sun</td>
</tr>
<tr>
<td>pm           am          pm          am          pm          am        pm        am</td>
</tr>
</tbody>
</table>

   **Fig. 39. Comparison of Ship’s Time in 1802 with Civic Time in 1802.**

   Notice that, in this case – ships approaching from the west – if one wished to convert to civil time, it is only the days and dates of the pm times that need to be brought back to the previous day.

   The practice of using ship’s time was to continue until 1805; the change to civil time being effected by Admiralty Circular of 11 October 1805 which ordered that “the calendar or civil day is to be made use of, beginning at midnight.” [The orders reached the Mediterranean Fleet too late for Trafalgar!]

   Until this time, ship’s captains such as Grant who published their journals would often convert the dates from the [ship’s time] entries in the ship’s log to civil time in the published book, for the benefit of landlubber readers.

2. **Discrepancy of a day due to crossing the 180° meridian:**

   Ships that reached Victorian waters from Europe or America from the east would have crossed the 180° meridian, and so the entries in a ship’s log west of that meridian would be out by a day. At the first opportunity, when a ship reached a settlement in the eastern hemisphere (such as Sydney or Batavia), an adjustment would be made to the ship’s log to bring the date into alignment with the civil date.

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295 The term ‘International Date Line’, which more-or-less follows the 180° meridian, is in fact a misnomer. Its exact course was never defined by any international treaty, law or agreement. At the end of the 19th century, George Davidson (1825-1911), the pioneer scientist and surveyor of the American West Coast, summed up the situation as: “There is no International Date Line. The theoretical line is 180° from Greenwich, but the line actually used is the result of agreement among the commercial steamships of the principal maritime countries.” Due to the lack of any international guide lines for the location of the date line, 20th (and 21st) century map makers have tended to follow the recommendations of the
Ships approaching Victorian waters from the west, or from an eastern settlement such as Sydney, would need no such adjustment to the ship’s log, having not crossed the 180° meridian.

Of all the early visiting ships to Victorian waters, the only one arriving from the east was James Cook’s *Endeavour*.

Example for ship’s log of a ship arriving from the east (prior to October 1805):

<table>
<thead>
<tr>
<th></th>
<th>Thurs 19/4</th>
<th>Fri 20/4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pm</td>
<td>am</td>
</tr>
<tr>
<td><strong>CIVIL TIME 1770</strong></td>
<td>Fri 20/4</td>
<td>Sat</td>
</tr>
<tr>
<td>pm</td>
<td>am</td>
<td>pm</td>
</tr>
</tbody>
</table>

**Fig. 40. Comparison of Ship’s Time in 1770 with Civic Time in 1770.**

Notice that, in this case – ships approaching from the east (prior to October 1805) – if one wished to convert to civil time, it is only the days and dates of the am times that need to be brought forward to the next day.
**APPENDIX II**

<table>
<thead>
<tr>
<th>COMPASS POINT</th>
<th>MAGNETIC BEARING</th>
<th>EXPLANATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>north</td>
<td>0°</td>
</tr>
<tr>
<td>NbE</td>
<td>north by east</td>
<td>11.25°</td>
</tr>
<tr>
<td>NNE</td>
<td>nor’-nor’-east, north-north-east</td>
<td>22.5°</td>
</tr>
<tr>
<td>NEbN</td>
<td>north-east by north</td>
<td>33.75°</td>
</tr>
<tr>
<td>NE</td>
<td>nor’-east, north-east</td>
<td>45°</td>
</tr>
<tr>
<td>NEbE</td>
<td>north-east by east</td>
<td>56.25°</td>
</tr>
<tr>
<td>ENE</td>
<td>east-north-east</td>
<td>67.5°</td>
</tr>
<tr>
<td>EbN</td>
<td>east by north</td>
<td>78.75°</td>
</tr>
<tr>
<td>E</td>
<td>east</td>
<td>90°</td>
</tr>
<tr>
<td>EbS</td>
<td>east by south</td>
<td>101.25°</td>
</tr>
<tr>
<td>ESE</td>
<td>east-south-east</td>
<td>112.5°</td>
</tr>
<tr>
<td>SEbE</td>
<td>south-east by east</td>
<td>123.75°</td>
</tr>
<tr>
<td>SE</td>
<td>sou’-east, south-east</td>
<td>135°</td>
</tr>
<tr>
<td>SEbS</td>
<td>south-east by south</td>
<td>146.25°</td>
</tr>
<tr>
<td>SSE</td>
<td>sou’-south-east, south-south-east</td>
<td>157.5°</td>
</tr>
<tr>
<td>SbE</td>
<td>south by east</td>
<td>168.75°</td>
</tr>
<tr>
<td>S</td>
<td>south</td>
<td>180°</td>
</tr>
<tr>
<td>SbW</td>
<td>south by west</td>
<td>191.25°</td>
</tr>
<tr>
<td>SSW</td>
<td>sou’-sou’-west, south-south-west</td>
<td>202.5°</td>
</tr>
<tr>
<td>SWbS</td>
<td>south-west by south</td>
<td>213.75°</td>
</tr>
<tr>
<td>SW</td>
<td>sou’-west, south-west</td>
<td>225°</td>
</tr>
<tr>
<td>SWbW</td>
<td>south-west by west</td>
<td>236.25°</td>
</tr>
<tr>
<td>WSW</td>
<td>west-south-west</td>
<td>247.5°</td>
</tr>
<tr>
<td>WbS</td>
<td>west by south</td>
<td>258.75°</td>
</tr>
<tr>
<td>W</td>
<td>west</td>
<td>270°</td>
</tr>
<tr>
<td>WbN</td>
<td>west by north</td>
<td>281.25°</td>
</tr>
<tr>
<td>WNW</td>
<td>west north-west</td>
<td>292.5°</td>
</tr>
<tr>
<td>NWbW</td>
<td>north-west by north-west</td>
<td>303.75°</td>
</tr>
<tr>
<td>NW</td>
<td>nor’-west, north-west</td>
<td>315°</td>
</tr>
<tr>
<td>NWbN</td>
<td>north-west by north</td>
<td>326.25°</td>
</tr>
<tr>
<td>NNW</td>
<td>nor’-nor’-west, north-north-west</td>
<td>337.7°</td>
</tr>
<tr>
<td>NbW</td>
<td>north by west</td>
<td>348.75°</td>
</tr>
</tbody>
</table>

Fig. 41. The Thirty-Two Points of the Magnetic Compass.

Note: 1 point = 11°15′, so ¼ point = 2°48′45″ ≈ 3°. Example: W¼S ≈ a bearing of 267°.
### APPENDIX III

**CONVERSION FACTORS FOR TECHNICAL PURPOSES**


<table>
<thead>
<tr>
<th>TO CONVERT FROM</th>
<th>TO</th>
<th>MULTIPLY BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>acre</td>
<td>hectare (ha)</td>
<td>4.046 856 × 10⁻¹</td>
</tr>
<tr>
<td>bushel</td>
<td>cubic metre (m³)</td>
<td>3.636 870 × 10⁻²</td>
</tr>
<tr>
<td>cable (&quot;a cable’s length&quot;) (= 1/10 of a nautical mile)</td>
<td>metre (m)</td>
<td>1.852 × 10²</td>
</tr>
<tr>
<td>fathom (= 6 feet)</td>
<td>metre (m)</td>
<td>1.828 8</td>
</tr>
<tr>
<td>gallon</td>
<td>litre (l)</td>
<td>4.546 09</td>
</tr>
<tr>
<td>knot (kn) (= 1 nautical mile/hour)</td>
<td>metre per second (m.s⁻¹)</td>
<td>1852/3600 ≈ 5.144 444 × 10⁻¹</td>
</tr>
<tr>
<td>(marine) league (= 3 nautical miles)</td>
<td>kilometre (km)</td>
<td>5.556</td>
</tr>
<tr>
<td>mile</td>
<td>kilometre (km)</td>
<td>1.609 344</td>
</tr>
<tr>
<td>nautical mile (n mile) (= “one minute of arc of a great circle of the earth”)</td>
<td>kilometre (km)</td>
<td>1.852</td>
</tr>
<tr>
<td>pound (lb)</td>
<td>kilogram (kg)</td>
<td>4.535 924 × 10⁻¹</td>
</tr>
<tr>
<td>ton</td>
<td>tonne (t)</td>
<td>1.016 047</td>
</tr>
<tr>
<td>ton</td>
<td>kilogram (kg)</td>
<td>1.016 047 × 10⁷</td>
</tr>
<tr>
<td>yard (= 3 feet)</td>
<td>metre (m)</td>
<td>9.144 × 10⁻¹</td>
</tr>
</tbody>
</table>

*Fig. 42. Conversion Factors for Technical Purposes.*
APPENDIX IV

POINT HICKS TO CAPE HOWE

[1971 note in The Victorian Historical Magazine: 'Brigadier Lawrence FitzGerald is a retired regular officer of the Royal Australian Survey Corps; he was Director of Army Survey at Army Headquarters from the 10 June 1942 to 5 January 1960; he is a Fellow of the Institution of Surveyors, Australia; he is an Honorary Fellow of the Australian Institute of Cartographers; and a member of the R.H.S.V.']

[1972 note by Editor of Traverse: 'This article relates to a dissertation prepared by Brigadier L. FitzGerald O.B.E. on the controversial issue as to the exact location of Cook’s landfall on the 19th of April, 1770, namely Point Hicks. The Brigadier has undertaken considerable research on this topic, and it is considered that there is much of interest to the surveying profession in his article…It should be noted that references have been omitted due to difficulty of presentation, and any reader interested in verification should consult the original paper.']

A highlight of the Captain Cook Bi-Centenary Celebrations in Victoria in 1970 was a ceremony on 20 April at the site of a cairn on Point Hicks at which the Premier, Sir Henry Bolte, said:

“In 1770, Captain James Cook named the point on which we stand Point Hicks. In 1843 Commander John Lort Stokes, R.N., named the headland Cape Everard and this is the name that it has carried ever since. My Government feels that it is appropriate in 1970, on the 200th anniversary of the sighting of this coast to revert to the original name which Captain Cook gave it; and I have been directed to declare, this day, that this spot shall henceforth be known as Point Hicks in the State of Victoria of the Commonwealth of Australia.”

The Premier further stated:

“There has been a great deal of controversy over the years as to the location of the first land that was sighted and also about the naming of it…”

The basis of the main controversy is a reference in Cook’s journal of 19 April as at 8 am:

“…The Southermost Point of land we had in sight which bore from us w¾S I judged to lay in the Latitude of 38º0′S and in the Longitude of 211º07′W [= 148º53′E] from the Meridion of Greenwich. I have Named it Point Hicks, because Leuit Hicks was the first who discover’d this land.”

There is however no land above the horizon west of the Endeavour’s position at that time, and no amount of argument or reasoning can put it there. Some writers allege that Cook mistook a cloud formation for land. Others who discounted the cloud theory attempted to show that Cape Everard was the feature Cook sighted. The charted position of Ram Head was questioned and now at this late stage, the naming of Cape Howe is challenged.

296  Brigadier L. FitzGerald O.B.E., ‘Point Hicks to Cape Howe’, The Victorian Historical Magazine, issue 165, vol. 42 (3), August 1971, pp. 579-96; the same article subsequently appeared in Traverse, 36 (March 1972), pp. 11-15; 38 (September 1972), pp. 4-6, but without references.

NAVIGATION AND CHARTING CIRCA 1770

To us on land it is a comparatively simple matter to determine our whereabouts, for there is much to note in the way of physical features which we may have come to recognise on sight, or there is probably a map to hand on which we can relate the features visible to us. But to the seaman, the water may extend to the horizon on all sides unrelieved by any landmark, and even if he has a nautical chart he still has the problem of positioning himself on it. He has to make the sky his map, with the sun, moon and stars his signposts. From them he has to determine his latitude and longitude as best he can with the tools, the date and what knowledge he possesses.

The navigator requires a *Nautical Almanac* to tell him the position of the heavenly bodies which he may observe. He needs an instrument which enables him to observe those bodies, and he needs a timepiece to measure their passage. All these are readily available at this present time but two hundred years ago they were not far past the embryo stage of development, and the navigator’s determination of position by astronomical observations was indeed subject to gross errors usually of an unknown quantity.

Cook’s voyage in the *Endeavour* in 1768-71 occurred at a significant period of evolution in Nautical Astronomy. The sextant had been improved to a marked degree by Hadley by 1731 and was an efficient instrument c. 1770. Maskelyne’s first *Nautical Almanac* appeared in 1767, and in 1765 the chronometer, developed over many years by Harrison, passed the acceptance trials required by the Board of Longitudes [*sic*] which then commissioned another clock maker, Kendall, to make a facsimile of Harrison’s fourth chronometer. That model was carried by Cook on board the *Resolution* in 1772, but he had no such accurate timepiece with him on the *Endeavour*. He could not carry Greenwich Time with him, so he had to determine it by observation of Lunar Distances – a technique only then advanced by Maskelyne and not previously practised by Cook on a prolonged voyage at sea.

Cook was experienced in navigating by dead reckoning, or by account, and he continued to do so without any remission, so providing a series of comparisons with the numerous astronomical fixes made by him and Green, his astronomer. The results are conflicting and require an analysis in depth of the several factors which all contribute some weight towards a final assessment. Those factors are: techniques and equipments; observations for latitude and longitude; magnetic compass bearings; determination of knots; soundings; currents; distances to shore; distance of the sea horizon; and the recording of features by description. Those factors are now analysed.

**DETERMINATION OF LATITUDE**

Latitude at sea is readily determined by observing the sun’s altitude at noon. This altitude combined with the sun’s declination is directly related to latitude, and an error of, say, one minute of arc conveys a like error to the computed latitude. The latitude is measured with a sextant[^298], the design of which permits the limb of the sun and the horizon to be observed simultaneously, thus minimising the effect of a moving deck. Furthermore, the sun’s passage at noon is sufficiently unchanging in altitude for a few minutes before and after transit to enable several altitudes to be observed, the mean of which provides a value correct within about one minute of arc.

A check on the accuracy attained by Cook can be got by comparing his observed values with the corresponding true values obtainable from modern charts and maps. This requires a judicious selection of land features which can be related to the ship’s position without the undue intrusion of other factors such as faulty directions and distances. Such a comparison of Cook’s observations along the Eastern Coast of Australia is shown in the following table (Fig. 43.):

[^298]: *Encyc. Brit.*
<table>
<thead>
<tr>
<th>Date</th>
<th>Latitude Values</th>
<th>O – T</th>
<th>Feature Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 April</td>
<td>35°19′</td>
<td>−2′</td>
<td>East of Pigeon House</td>
</tr>
<tr>
<td>6 May</td>
<td>33°50′</td>
<td>0</td>
<td>Abreast Port Jackson</td>
</tr>
<tr>
<td>15 May</td>
<td>28°39′</td>
<td>0</td>
<td>Cape Byron 3 miles</td>
</tr>
<tr>
<td>25 May</td>
<td>23°24′</td>
<td>−2′</td>
<td>C. Capricorn &amp; Hummocky I.</td>
</tr>
<tr>
<td>28 May</td>
<td>22°08′</td>
<td>−1′</td>
<td>Donovan Shoal</td>
</tr>
<tr>
<td>2 June</td>
<td>20°56′</td>
<td>+1′</td>
<td>Off C. Hillsborough</td>
</tr>
<tr>
<td>3 June</td>
<td>20°26′</td>
<td>−2′</td>
<td>C. Conway 4 miles</td>
</tr>
<tr>
<td>8 June</td>
<td>17°59′</td>
<td>0</td>
<td>Near Dunk Island</td>
</tr>
<tr>
<td>29 June</td>
<td>15°26′</td>
<td>−2′</td>
<td>In Endeavour River</td>
</tr>
<tr>
<td>13 August</td>
<td>14°38′</td>
<td>0</td>
<td>One mile off Lizard I.</td>
</tr>
<tr>
<td>22 August</td>
<td>10°46′</td>
<td>−2′</td>
<td>In Endeavour Strait</td>
</tr>
</tbody>
</table>

Fig. 43. Comparative Table of Observed and True Values of Latitude.

It will be noted that the mean error of observation is 1 minute of Latitude and the maximum error is 2 minutes. No point selected for comparison was rejected. A significant conclusion to be reached is that a difference of five or more minutes would be highly suspect. Such conclusion is applied later in considering the location of Ram Head.

**DETERMINATION OF LONGITUDE**

Longitude is an expression of the difference between local time and Greenwich time. On his first voyage in 1770, Cook did not have the benefit of the chronometer developed by Harrison; nor were the ship’s watches good enough to maintain time beyond a few hours.

Local time could be deduced from the observed latitude, the sun’s altitude, and its declination taken from the *Nautical Almanac*. Greenwich time of observation was determined by a method developed by Maskelyne, the Astronomer Royal, and promulgated in 1761. Referred to as the method of “Lunar Distances”, the calculation was based on angular distances between the sun and the moon as measured with the sextant. Maskelyne’s first *Nautical Almanac* tabulated the predicted angular distances of the moon from the sun for the year 1767. This data for lunar distances continued to be published until 1907 by which time the method had fallen into disuse.

Cook did not claim accuracies from this method any better than thirty minutes of arc. Flinders wrote of it:

“Time keepers were in their infancy in 1768, when captain Cook sailed upon his first voyage, and he was not then furnished with them; his longitude was therefore regulated only by occasional observations of lunar distances and some few of Jupiter’s satellites, which even in the present improved state of instruments and tables, require to be connected by time keepers before satisfactory conclusions can be drawn. Errors of greater or less magnitude were thence unavoidable; at Cape Gloucester, where I quitted the East Coast, my longitude was 20½′ greater than captain Cook’s chart, – at Cape York where the survey was again resumed, it was 58½′…”

Cook departed from King George Island (Tahiti) on 13 July, 1769. He carried the longitude he had established for George Island by daily account until he made lunar observations on the day of his

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New Zealand landfall, 7 October. His journal then records 300: “…the error of the ship’s account in Longitude from George’s Island is 3°16’…” That error is equivalent to 154 miles.301

In like manner, Cook carried his value of longitude by account from Cape Farewell, N.Z. until on 17 April he again made lunar comparisons. He recorded302:

“Tuesday 17th. (1770)…an opportunity of taking several observations of the Sun and Moon…the longitude of the Ship at Noon was 207°58’ and by the Log 208°20’ the difference being only 22’ and this error may as well lay in the one as the other…”

Although an inherent inaccuracy of the order of over 20’ of arc is generally recognised for lunar observations, it will happen that an occasional determination will approach much nearer to the true value. A fortuitously close agreement should not be used as an argument in charting. Where such charting is directed to re-establishing relative position within twenty miles, Cook’s longitude determinations by lunars must be wholly disregarded.

THE MAGNETIC COMPASS

Cook’s observations of directions with the magnetic compass play such an important role in the identification of coastal features that a close examination of the behaviour of such compasses is well warranted.

[At any place on the earth’s surface, the (magnetic) declination is the scientific name for the angle between the vertical plane containing the direction of the earth’s magnetic field at any place (the magnetic meridian) and a vertical plane containing the geographic north and south meridian. In short, it is the angular deflection of the compass needle, E or W from true north. When not otherwise disturbed, the compass needle will lie in the direction of the earth’s magnetic field. In navies and air forces the older term of magnetic variation is used.

On the other hand, the term deviation of the compass refers to the angle through which the compass needle on board ship (or airplane) is further deflected from the magnetic meridian due to the ship’s (or airplane’s) own magnetic field. The resultant difference from true north is the total compass error, and combines the (magnetic) declination and the deviation of the compass.303

An azimuth compass is an instrument for finding either the magnetic azimuth or amplitude at sea. Amplitude is the complement of the azimuth. Magnetic azimuth is an arc of the horizon, contained between the magnetic meridian and the azimuth or vertical circle of the celestial body. It is an ortive azimuth when the celestial body is rising (in the east), and an occiduous (or occasive) azimuth when the celestial body is setting (in the west). Magnetic amplitude is an arc of the horizon, contained between a celestial body at its rising or setting, and the magnetic east or west point of the horizon, indicated by the magnetic compass. It is an ortive amplitude when the celestial body is rising (in the east), and an occiduous (or occasive) amplitude when the celestial body is setting (in the west).304]

When a ship is being built she becomes a magnet. Some of its magnetism is acquired from the vibrations through the hull while lying on the slip. Other magnetism may be imparted during fitting out. All this produces a magnetic condition at the compass position which, in a steel ship, could exercise a stronger influence than the earth’s magnetic field. This influence would be less in the wooden ships of Cook’s day, and in fact was surprisingly unsuspected by him.

301 Throughout this paper all references to ‘miles’ imply ‘nautical miles’.
304 Adapted from definitions in George Crabb, Universal Technological Dictionary or Familiar Explanation of the Terms used in all Arts and Sciences, Containing Definitions Drawn from the Original Writers, vol. I, Baldwin, Cradock and Joy, London, 1823.
Cook carried two compasses on the *Endeavour*. One was the conventional steering compass mounted in the binnacle, the card being primarily graduated in 32 points each of $11\frac{1}{4}^\circ$. The ship’s course would be recorded in the day’s log as, say, NNE. The second compass was an Azimuth Compass. Cook had sought and obtained from the Navy Board a Knight Compass of an improved construction, on which he was directed to report. He did so on 12 July, 1771:

“*Endeavour*…I am to acquaint you that I never once was able to make use of the compass in a troubled sea, and the reason was this, I could not make the brass box keep a horizontal plain; the motion of the ship always made it incline one way or another, from which it would not of itself return;…I think it by far too complex an instrument ever to be of general use at sea.”

The primary application of the Azimuth Compass was the determination of the magnetic variation, usually by observing the sun’s amplitude or bearing at sunrise or set. It was graduated in degrees by quadrants from $0^\circ$ to $90^\circ$. A bearing to a land feature could also be taken. The log of 19 April, for example, records variation $8^\circ07'\ E$, and a “remarkable point (Ram Head) N 12º E”.

<table>
<thead>
<tr>
<th>H.</th>
<th>K.</th>
<th>F.</th>
<th>Courses</th>
<th>Winds</th>
<th>Remarks, &amp;c.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>...</td>
<td>W.</td>
<td>S.b.W.</td>
<td>Fresh gales and squally, with a great sea from the S’ward.</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>...</td>
<td>...</td>
<td>S.S.W.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>...</td>
<td>W.½N.</td>
<td>...</td>
<td>A great number of porposeses about the ship.</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>4</td>
<td>...</td>
<td>...</td>
<td>Handed the topsails.</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>5</td>
<td>W.b.s.</td>
<td>S.b.W.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>4</td>
<td>...</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>...</td>
<td>wd.</td>
<td>S.S.W.</td>
<td></td>
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<tr>
<td>10</td>
<td>3</td>
<td>...</td>
<td>W.½N.</td>
<td>...</td>
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</tr>
<tr>
<td>11</td>
<td>3</td>
<td>...</td>
<td>wd.</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>Squally, with flying showers of rain; haul’d up the mainsail and lay too.</td>
</tr>
<tr>
<td>1</td>
<td>...</td>
<td>...</td>
<td>lay too</td>
<td>up</td>
<td>Sounded, no ground at 130 f’m of line. At 1 set the mainsail.</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>...</td>
<td>w.b.s.</td>
<td>S.S.W.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>Fresh gales and fair wea’r.</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>Sett the topsails.</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>4</td>
<td>...</td>
<td>...</td>
<td>Saw the land making high, bearing from N.E.b.N. to W.b.s.; dist’ce off the nearest shore, 7 or 8 leagues; out all reefs and made sail.</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>5</td>
<td>...</td>
<td>...</td>
<td>Bore up for the land.</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>2</td>
<td>...</td>
<td>...</td>
<td>Variation p’r sev’l azymuths, 8º07’E.</td>
</tr>
<tr>
<td>9</td>
<td>5</td>
<td>2</td>
<td>N.E.</td>
<td>...</td>
<td>Bent the best mainsail and main topsail.</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>...</td>
<td>N.E.B.E.</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>4</td>
<td>3</td>
<td>E.N.E.</td>
<td>...</td>
<td>Att noon A fresh gale and cloudy squally wea’r, with some small rains; the ext’s [extremes] of the land in sight from N.W.b.W. to E.b.N.; a remarkable point N.12º E. Lat’d observ’d, 37º50’So.</td>
</tr>
</tbody>
</table>

Fig. 44. Cook’s Official Log for 19 April 1770.
(From *Historical Records of New South Wales*, vol. I, part 1, p. 87.)

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Cook’s condemnation of the Azimuth Compass is qualified by his reference to a troubled sea. It was not in daily use for determining variation, and he would have selected favourable times and conditions for observing with it. His determinations along the east coast show reasonable consistency between themselves and with later ones by Flinders. His observations appear to be correct within 5° — not critical for navigation and charting. It must be recalled however that the steering compass was subject to error many times greater.

Flinders, during his voyage to Australia in 1801-4, became the first to carry out serious experiments into the phenomena of deviation and to propose a corrector, the vertical bar of soft iron which now bears his name. 306 He expressed the view that the compasses of his day were the worst constructed instruments of any carried to sea, and:

“...errors arising from the badness of compasses...appear to be in the three ships commanded by captain Cook. It seems indeed extraordinary, that...he should not have discovered, or suspected, that the attraction of the iron in the ship was the primary and general cause of the differences so frequently observed; nor have perceived that the differences varied proportionally to the direction of the ship’s head...”

Banks was obviously aware of navigational failings when he commented rather cynically in his journal 307:

“3 April (1770). Wind as yesterday: we got fast onto the Westward but the Compass shewd that the hearts of the people hanging that way caused a considerable North variation which was sensibly felt by our navigators, who called it a current as they usually do everything which makes their reckonings and observations disagree.”

Flinders experienced the “badness of compasses” on the Francis, 2 February 1798, off Bateman Bay 308: “…but I am sorry to say the steering compass of the schooner proved to be bad...”


Scoresby was a former whaling ship master, practised in bringing ships to haven as well as souls to heaven. He wrote:

“General Character of Compass Needles previously in Use.
Prior to the construction of the instrument just described (1836) the needles in ordinary use, both in the Royal and Mercantile Navies, were excessively defective in qualities the most important for the real effectiveness and durability of action of the compass. They were generally weak and unenduring, while those supplied to the Royal Navy were, I believe, amongst the worst of their kind. I have tried and tested...a very considerable number of compass needles, by various makers; few were moderately good; not a few were intolerably bad. Nine needles were furnished me...in 1836, as fair specimens of those then in use in the Navy...two out of four, by one of the accredited makers for the Admiralty were utterly incapable of performing their intended function...”

Further:

306 Flinders, vol. II, appendix II.
“2 April 1856…All our compasses, under the heavy seas of this day, went wild as to steadiness. Both the adjusted compasses on the floating principle oscillated continually, sometimes to the extent of four or as I was told even six points, or more. The compass aloft was equally unsteady…”

Such vagaries of the compass needle were common, and the magnitude of up to six points (67½°) requires one to regard most observations with the steering compass with a considerable amount of suspicion; sufficient to warrant the rejection of an observed bearing of, say, W in favour of a probable bearing of WNW, if other factors suggest the latter to be more correct.

THE LOG LINE

The Log and Line309 was an original English contribution to the mariner’s art. What the English did was to tie a log of wood to a chord, heave it overboard, and measure the line paid out while someone turned the minute sand glass. The measuring section of the line was marked by sections indicated by knots. The distance between the knots bore the same relation to the nautical mile as 28 seconds of time does to the hour. This closely approximated 48 feet. It followed that if, say, five knots of the line ran out in 28 seconds by the sand glass, the ship was moving at the rate of 5 nautical miles an hour, or 5 knots. This was entered into the ship’s log under the column “K”. The 48 feet were further divided into eight intervals each of six feet and entered under column “F” for fathoms. These observations were usually made on the hour throughout the voyage and under favourable conditions they gave results which can be accepted in good faith. There are no valid reasons for rejecting or manipulating Cook’s determination of Knots, but the correct plotting of a course still involves associating knots with compass bearings, and if the latter are grossly in error, then so is the plot.

SOUNDINGS

A sounding with the Deep Sea Lead, as a measure of depth below the surface is positive and probably correct within one fathom over moderate depths. Its location, however, may well be uncertain, and the value of the sounding is lost if it cannot be reliably positioned on a chart. Conversely, if a good chart is available, the soundings can be positioned within limits. The log of 20 April, for example, records “Sounded in 56 fathoms…an island W 6 miles…” The island referred to is Gabo Island and the position 6 miles east establishes the ship in 53 fathoms. The 56 fathoms point on the modern chart lies 7 miles east of the island.

Cook’s soundings would be subject to an adjustment for tide variations, a factor not usually established by him, but significant in shallow waters such as he experienced within the Barrier Reef. A sounding of, say, 4 fathoms at high tide could well be below 3 fathoms at low tide, with consequent danger of running aground.

OCEAN CURRENTS

The equipment and techniques available to Cook for the determination of ocean currents were quite elementary. One method used was to hold a small boat with a sea anchor and observe the direction and magnitude of the drift of the log line.310 Another way was to observe the movement of the ship when hove to relevant to a land feature.311 A third method was to attribute the difference between an observed latitude and that by account to the effect of current.312

312 ibid., vol. I, p. 166.
Flinders was no better equipped but he was more deliberate and observant. He records\(^\text{313}\):

“It is a fact difficult to be reconciled, that whilst the most prevailing winds blow from S.E. in summer, and S.W. in winter, upon this extra-tropical part of the East Coast, the current should almost constantly set to the south; at a rate which sometimes reaches two miles an hour. Its greatest strength is exerted near to the points which project most beyond the general line of the coast; but the usual limits of its force may be reckoned at from four, to twenty leagues from the land... It is in the most southern parts that the current runs strongest, and towards Cape Howe it takes a direction to the eastward of south; whereas in other places, it usually follows the line of the coast.”

Cook’s average day’s voyage was about seventy miles and a current of one knot would be a significant component. A current with a mean east-west value of only one-tenth of a knot between Tahiti and New Zealand would more than account for the 154 miles difference between the observed longitude and that by account, referred to previously. In determining the *Endeavour*’s position at any time, it must be recognised that the current is significant near the coast but its magnitude and direction remain uncertain quantities.

Even today the currents in Bass Strait and around the coast beyond Cape Howe, are by no means determined, and it is a strange commentary that it may take an evil circumstance in the nature of pollution by an oil slick, to reveal just how the current flows.

**DISTANCES**

Cook needed to determine or estimate distance from the ship to the coastal feature he wished to fix on his chart. This could be done by first estimation, or by supplementary cross bearings from a second or third ship’s position. The first estimate would be entered in the log usually in terms of leagues. Cook would enter his revised value in his journal. For example, the log of 19 April records at 6 am land distant 7 or 8 leagues. The corresponding entry in the journal is 5 or 6 leagues. At noon on that same day, the log gives a bearing to a “remarkable point”, but does not record a distance. The journal gives a distance of 4 leagues. At 8 am the journal records land bearing W\(\frac{1}{4}S\) and its longitude relative to the ship. The difference of 28\(^{\prime}\) of longitude, equivalent to 22 miles, reflects an estimated distance of about 7 or 8 leagues, and not a longitude observation.

Cook “judged” this distance and there was no opportunity for a subsequent check by cross bearing. Also, this was Cook’s first sighting of land after leaving New Zealand, and he could well have lost his “eye for distance” to a degree which warrants regarding his estimate with a considerable amount of tolerance.

Banks commented in his journal of 22 April:

“...It has long been an observation among us that the air in the Southern Hemisphere was much clearer than in our northern, these same days at least it has appeared remarkably so. A headland called Dromedaries Head, not remarkably high, has been seen at the dist. of 25 L’gs and judged by nobody to be more than 6 or 8 from us; it was now in plain sight and our distance from it by our ship’s run was 23 l’gs, yet the Sea men acknowledg’d that tho they knew how far it was from them they could not think that it appeared more than 10 l’gs off...”

Instances are numerous of distances recorded in Cook’s journal being in error by over 30 per cent, either way.

DISTANCE OF THE SEA HORIZON

The distance to the sea horizon can be got readily from tabulated values or can be calculated. The factors are the earth’s curvature, atmospheric refraction, and the height of the observer. The distance to the sea horizon from an observation height of, say, 20 feet is five miles. From a mast height of 50 feet, it is 8 miles. Conversely, if the distance to the horizon is known, the height can be deduced.

An observation from ship to shore is made up of the two components of tangential distances – ship to horizon and horizon to shore. A ship to shore distance of, say, 22 miles, in the case of a deck height of 20 feet, comprises 5 miles from ship to horizon and 17 miles from horizon to shore, the latter corresponding to a height of about 200 feet above sea level. This means that no land below that level would be visible from the ship’s deck, and in the absence of other evidence, it would be presumptuous to designate the land below that line of sight as falling away to the coast to terminate in a cape or point.

DESCRIPTION OF COASTAL FEATURES

Cook’s self-imposed mission at that time was one of discovery and not one of detailed charting. Many features which later became delineated and named on more up-to-date charts and maps were not considered sufficiently significant to Cook to warrant a mention in his log or journal.

His chart does not depict Green Cape, the most prominent point of coast between Wilson’s Promontory on the south coast and St. George’s Head (Jervis Bay) on the east coast. Furthermore, some features which he did record were subsequently found to be incorrectly delineated. Flinders’ comment is relevant:

“(3 Feb., 1798) Soon after noon, land was in sight to the S.S.E., supposed to be the Point Dromedary of captain Cook’s chart; but, to my surprise, it proved to be an island not laid down, though lying near two leagues from the coast… When captain Cook passed this part of the coast his distance from it was five leagues, and too great for its form to be accurately distinguished. There is little doubt that Montague Island was then seen, and mistaken for a point running out from under Mount Dromedary…”

Cook’s naming of some features left no doubt concerning their subsequent identification. He named Mount Dromedary on account of its figure; Point Upright because of its perpendicular cliffs; Pigeon House because it looked like one; and Cape Three Points because of its three bluff points. The three features he named following landfall were Point Hicks, Ram Head, and Cape Howe. Their recognition is not so obvious from description and they require examination in detail and in association with other factors. (Fig. 45.).

Cook’s journal of 20 April records:315:

“…At 6 o’clock…brought too for the night having 56 fathom water…and a small island lying close to a point on the Main west distant 2 Leagues. This point I have named Cape Howe, it may be known by the Trending of the Coast which is north on the one side and SW on the other…it may likewise be known by some round hills upon the Main just within it…”

The small island is undoubtedly Gabo Island, and the ship’s position 2 leagues east conforms closely to a sounding of 56 fathoms on modern charts. The nearest point on the main to which the island is “lying close” is that depicted on modern charts as Telegraph Point. There is another point of land four miles to the north-east to which the name of Cape Howe has been attributed and which has been accepted by common usage. Cook’s chart (Fig. 46.1.) does not delineate two separate points of land, and the name Cape Howe which appears thereon, conveys no more than that the feature lies close to the island.

Pickersgill’s chart316 (Fig. 46.2.) shows the two separate points but does not attribute a name to either.

Had Cook noted the existence of the two separate points, and if he had intended that the more northerly one was to be known as Cape Howe, he would surely have noted a bearing to it to the north-west.

On 4 February, 1798, Flinders, on a southerly course, approached the more northerly point. He commented317:

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“On coming abreast of Cape Howe, the wind chopped round to the south-west, and the dark clouds which settled over the land concealed it from our view; we observed, however, that it trended to the west, but sought in vain for the small island mentioned by captain Cook as lying close off the Cape.”

Flinders did not get another opportunity to sight *Gabo Island*. He accordingly gave more shape to the point he had seen and on his chart (Fig. 46.3.) he applied the name of *Cape Howe* to it. If he had sighted *Gabo Island* four miles to the south-west, his puzzlement as expressed in his journal would have turned to considerable doubt and, in all probability, to a conviction that the more southerly point was the one named by Cook.

Flinders’ chart was undoubtedly used by Stokes\(^\text{318}\) who commented:

“The error I found in the position of Two Fold Bay induced me to commence our survey there, for the purpose of ascertaining the position of *Cape Howe*, which I discovered to be rather more out in longitude; while the islet, instead of lying off it, lies four miles to the south west.”

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![Fig. 46. Outline of Coastal Features in the vicinity of Cape Howe, based on](image)

**Fig. 46.** Outline of Coastal Features in the vicinity of Cape Howe, based on

- Fig. 46.1. Cook’s chart. 1770.
- Fig. 46.2. Pickersgill’s chart. 1770.
- Fig. 46.3. Flinders’ chart. 1798.
- Fig. 46.4. Current chart. 1971.

The comments of Flinders and Stokes both point to the fact that the more northerly of the two points does not fulfil the description of Cook of “lying close” to the island. There surely can be no doubt that the more southerly point, now known as *Telegraph Point* was the one referred to by Cook. It fulfils perfectly the additional qualification of having “…some round hills upon the Main just within it…”

Supporters of the de facto siting of *Cape Howe* may argue that it conforms exactly to the qualification of the trending of the coast, N and SW. That is so if the description is applied to the immediate vicinity

\(^{318}\) J. Lort Stokes, *Discoveries in Australia…*, ch. XIII, p. 418.
of the point but, from the ship two leagues distant, Cook would not have attempted to define form in such detail, and the trend he referred to would have applied in a broader sense to stretches of the coast of the order of, say, ten miles as depicted in his chart. (Fig. 46.1.) In that sense *Telegraph Point* qualifies.

This error in nomenclature is perhaps of interest to jurists as well as to historians, as *Cape Howe* was the terminal of the boundary of the new colony of Victoria as defined in the *Australian Constitution Act 1850*:\(^{319}\)

“(1) Constitution of Colony of Victoria,
…The territories now comprised within the District of Port Phillip, including the town of Melbourne and bounded on the north and north-east by a straight line drawn from Cape Howe [*sic*] to the nearest source of the River Murray…shall be separated from the colony of New South Wales…and shall…thenceforth form a separate colony, to be known and designated as the colony of Victoria.”

If the boundary defined in the Constitution applied to the point originally named by Cook, and not to the de facto *Cape Howe*, then New South Wales lost to Victoria a wedge of country about one hundred miles long, on a base of about four miles, or about two hundred square miles of territory.

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\(^{319}\) *The Complete Statutes of England*, vol. 5.
RAM HEAD

Cook’s journal of 19 April\textsuperscript{320} records his sighting and naming of the feature, \textit{Ram Head}:

“…At noon we were in the Latitude of 37º50′…a remarkable point bore N 20º East distant 4 leagues. This point rises to a round hillick, very much like the \textit{Ram Head} going into Plymouth Sound on which account I called it by the same name…”

The fact that another feature now bears the name of \textit{Little Ram Head} is a good indication that there is a resemblance between the two, and a controversy has arisen as to which is the feature named by Cook. Accepting the bearing and distance given above in good faith and plotting the ship’s position back from the two points, the resultant latitudes are 37º52′ from \textit{Little Ram Head} and 37º57′ from \textit{Ram Head}. The latter is 7′ away from the noon observed value and is accordingly rejected because of the conclusions arrived at previously. The value from \textit{Little Ram Head} is only 2′ away and is acceptable on that score.

Cook described the feature as rising to “a round hillick”. The writer, through the courtesy of the Department of Shipping and Transport, was able to procure a photograph of \textit{Little Ram Head}, taken out at sea in an attempt to recapture the view as seen by Cook. That photo, reproduced in \textbf{Fig. 48.}, shows distinctly a “round hillick”, which evidence combined with the latitude agreement is regarded as more than sufficient for concluding that the feature now known as \textit{Little Ram Head} is, in fact, that which Cook named \textit{Ram Head}.

\begin{center}
\includegraphics[width=0.5\textwidth]{Little_Ram_Head_photo.jpg}
\end{center}

\textbf{Fig. 48.} Cook: “This point rises to a round hillick.”

(Photo taken with the co-operation of the Department of Shipping and Transport.)

\textsuperscript{320} Beaglehole, vol. I, p. 299.
The controversy over the feature named Point Hicks by Cook centres around the reference to “the Southermost Point of land we had in sight which bore from us W¼S …” 321 There is no land above the sea horizon and westerly from the ship’s position at that time, and some writers have concluded that Cook’s alleged land must have been a cloud.

In that same general area on 14 October, 1798, Flinders, in the Norfolk, had occasion to wonder if what he saw 25 leagues to the north, was land or cloud. He wrote 322:

“…This supposed land was visible all the afternoon; but it might possibly have been the dense clouds hanging over the hills at the back of the Long Beach, and not the land itself.”

Flinders makes it clear that a cloud formation can sufficiently resemble land form to cause uncertainty, particularly over a long distance. At shorter range, any resemblance or lack of it would be more transparent. In any case, any uncertainty would be cause for comment. Cook made no mention of cloud at the time, and in fact commented that it was very clear to the south in which direction he looked in vain for Van Diemen’s Land. The cloud theory concerning the, so far, mythical Point Hicks, is untenable if gross mal-functioning of the compass is recognised.

Bass attempted to locate Cook’s Point Hicks during the voyage in the whaleboat in 1797. Flinders wrote of it 323:

“…Mr. Bass left the Ram Head early on the 31st. His course was W. by S. close to a low, sandy coast; the beach being interrupted by small, rocky points, not oftener than once in ten or fifteen miles… The furthest land seen by captain Cook, is marked at fifteen leagues from the Ram Head, and called Point Hicks; but at dusk Mr. Bass had run much more than that distance close along the shore, and could perceive no point or projection which would be distinguishable from a ship…”

The reference to the “small, rocky points” now identifies in succession west from Ram Head: Petrel Point, Cape Everard, Pearl Point, Cape Conran, and Point Ricardo. Of these, Cape Everard projects most seawards, but still falls within the category of points “not distinguishable from a ship”. It bore 5° W of N from the Endeavour at 8 am, about 5 leagues. Banks described the land and vegetation in the area but did not associate such with any prominence as a Cape or Point.

West of Cape Everard, to Marlo, distant 35 miles, there is no point or feature within 3 miles back from the coast that could be seen above the ship’s horizon. Six miles NNE of Marlo is Mount Raymond, 964 feet above sea level. It is 39 miles from the Endeavour’s position at 8 am and at that distance, the earth’s curvature would account for about 860 feet, leaving about one hundred feet of the highest part visible from the ship. Mount Raymond would be the extreme point of land seen by Cook towards the west. Its direction from the ship’s position is N 60° W which is 33° away from the observed bearing of W¼S – a departure which can be accepted in the light of the established compass vagaries. The difference in distance also can be accepted.

No one would have been more aware than Cook of the effect of the horizon blocking out lower lands at a distance, and for him to have given the title of “Point” to a feature of land 22 miles away, on his estimation, with the lower 200 feet obscured, requires a realization that the term “Point” is not necessarily restricted to a coastal feature projecting seawards. An example is Point Bonney (3705 ft.) on the SE rim of Wilpena Pound in the Flinders Ranges of South Australia. There would have been so

little of the top of Mount Raymond seen by Cook that he would have been hesitant to call it a mountain. In the absence of a better term to apply to such a feature, he called it Point Hicks. This reasoning is supported by his own chart in which the coast line swings away towards the south west without any coastal projection being depicted in the vicinity.

Cook was unaware of the serious vagaries of his compass and he believed that the feature on which he had bestowed the name of Point Hicks was the most southerly point seen by him. In this he was wrong. Cape Conran is the most southerly point of the coast in that vicinity but it was below the horizon. The most southerly point of land literally seen by Cook was Cape Everard.

CONCLUSIONS

Point Hicks: The feature which Cook sighted and named Point Hicks is that now known and mapped as Mount Raymond. Cook mistakenly believed it to be the most southerly point of land he saw. The Victorian Government, by re-naming Cape Everard – Point Hicks, happily, fittingly, and somewhat unwittingly, fulfilled the intention of Cook to name the “southermost point of land we had in sight” after Lieut. Zachary Hicks, the “first who discovered this land”.

Ram Head: The feature which Cook named Ram Head is that now known as Little Ram Head.

Cape Howe: The feature which Cook named Cape Howe is that now known and charted as Telegraph Point.
APPENDIX V

MR BOWEN'S REPORT ON THE FIRST ENCOUNTER BY MURRAY’S MEN WITH THE LOCAL INHABITANTS, AS TOLD BY MURRAY

“Monday 4 January [1802]. Variable weather. At 2 pm [by nautical reckoning] the launch returned. We have got at last some knowledge of the natives of this part of the country. The following is the substance of the report of Mr Bowen, 1st Mate:-

At 7 am left the head of Fresh Water River324 having in vain looked for some of the crowned birds,325 and having been able to shoot nothing (a few ducks excepted), having proceeded down the river, and being nearly half-way on board [,] he observed a fire lighted on the beach between Crownhead326 and the entrance of the River and thinking it could be nothing but natives he immediately put back to prove this. As the boat approached the beach these blacks were perceived sitting in the same form as those of Sydney, and each of them had a bundle of spears in their hands. Our people hallowed them which they instantly answered and did not seem at all alarmed on the nearer approach of the boat, three boys made an appearance. As between the beach and the boat there lay a bank of mud about 200 yards across, Mr Bowen could not get quite so close as he could wish, however, he singly got out and began to walk towards them, when which they perceived, they jumped upon their feet and it was now perceived that one of them was a very old man with a large bushy beard and the rest of his face besmeared with red ochre. The others were young men. They were all clothed with the skins of oppossums327 as far as their middle, and this old man seemed to have command over the others. As Mr Bowen advanced [,] they all pulled off their dress and made signs to the officer that before he came any nearer he must do the same; this was immediately complied with.

They then all sat down again and Mr Bowen, plucking a root of fern, advanced pretty close to them holding it up; they seemed to understand it as it was meant.328 When he got within a few yards of this party the old man seemed rather uneasy and began to handle his spears. Mr Bowen then threw them a tomahawk, and one of the young men picked it up; on Mr Bowen beckoning them to sit down, he doing the same, they again threw him back the tomahawk, and all except the old man sat down. Mr Bowen then broke a piece of stick and cut it with the tomahawk and tyed a handkerchief to it and again reached it to them; on this, one of the young men ventured to reach his hand and take it out of the officer’s but would by no means be so familiar as to shake hands. Mr Bowen then ate some bread and then gave them some which they did not eat, but carefully laid it by under some fern roots or leaves; on getting some ducks they took no other notice of them than to examine in what manner they were killed, what their ideas on that head329 were we know not [,] as they did not take the least notice of our firearms even when, towards the latter end of the parley, it was found necessary to point one at the breast of the old man who all along was very suspicious of our designs.

All this time they expressed a good deal of wonder at the colour of Mr Bowen’s skin, and one of the young men made very significant signs to him that he must have washed

324 Fresh Water River: Bass River.
325 crowned birds: Gang-gang Cockatoos.
326 Crownhead: so-named because of the Gang-gang cockatoos which were first caught near there. Later referred to as Crown Head.
327 oppossums [sic]: possums.
328 they seemed to understand it as it was meant: i.e., as a sign of peace.
329 on that head: on that topic.
himself very hard. They now made signs for Mr Bowen to go back to the boat and pointed
down along the beach to Crown Head. Mr Bowen accordingly went into the boat and
pulled down as they walked, after pulling about 1½ miles they stopped and beckoned
for the boat to come in – here 3 women made their appearance each with a child at her
back. Mr Bowen went on shore here, little [exchange] passed on either side [,] further
than on Mr Bowen asking for fire to warm himself. They pointed to the boat and made
signs for him to go there and get it [,] the women sometimes shook their hands to him, and
the boys laughing and hooping. A few more trifles were here given to them. A little
before this [,] all our people got out of the boat stark naked as was desired and walked
somewhat near the natives, on which the old man sent the boys away to the women, and
he, after having been in a great passion, made signs for us to go to the boat, began to
retire with his face to us and brandishing his spear as that everyone thought he would
heave it, when our people turned their backs the young men seemed more quiet. As we
saw that all hope of further intercourse for the present was at an end Mr Bowen ordered
Bond to fire his [musket] piece over their heads in order to make good his retreat to the
boat. This had the desired effect, as they one and all were out of sight in an instant.
Before this [,] they must have taken the musket for nothing but a stick. All the weapons
they possessed were their spears (of a small size) and a stone tomahawk along with the
wumera they threw with. With respect to their size [,] the young men were much the same
as those of Sydney or Jarvis Bay. They were not deficient in making out our signs, and we
were easy able to understand from their motions what they would be at. From there being
but little food for them on the beaches here, and their being clothed in the skins of the
oppossums, I presume they are Bush natives, the women, I forgot to mention, appeared to
be middling well shaped, and good-looking children, they were, however, always at some
distance.

Mr Bowen and the people having joined the boat [,] came on board. Observed all the
remainder of the day they retired back into the woods and about 6 pm dous’d their fire at
once although it must have covered an acre of ground. At 4 am a light wind sprung up at
E., got our ketch hove short, loosed sails and hove up – made sail for Elizabeth’s
Cove…”

330 pulled down: rowed.
331 retire: retreat.
332 Ida Lee, pp. 108-112; see Labilliere, vol. I, pp. 68-70, for a slightly different transcription from Murray’s journal. Both
used the version of Murray’s journal kept in the Public Record Office, London. See also Valda Cole, The Summer Survey,
2001, pp. 33-5, for a recent transcription, this time from the copy held in the Hydrographic Office, Taunton, Somerset.
APPENDIX VI

MR BOWEN’S REPORT ON THE SECOND ENCOUNTER BY MURRAY’S MEN WITH THE LOCAL INHABITANTS, AS TOLD BY MURRAY

“Tuesday 16 February [1802]… [late morning] I sent the launch with Mr Bowen and 4 hands armed to see if any natives were here, and before the boat was half-way on shore we had the satisfaction of seeing 18 or 20 men and boys come out of the wood and seat themselves down on a green bank waiting the approach of our boat with which I had sent some shirts and other trifles to give them; the boat accordingly landed in the midst of them and a friendly intercourse took place with dancing on both sides – in an hour the boat returned. Mr Bowen had dressed them in our white shirts and invited them on board, this however they declined, but exchanged for all this got a basket of straw neatly enough made. They were all clothed in the skins of opossums and each had a bundle of spears, a stone mogo and one basket. They wished much to know what our arms were and their use[,] and did not seem entirely to believe Mr Bowen that they were only walking sticks – no women were amongst them. I sent the boat again with some bread, looking-glasses, tomahawk and a picture as presents to induce them to part with their weapons and dresses as also to inform us where there was water…

Wednesday 17 February…The boat (as mentioned in latter part of yesterday’s log) proceeded to the shore and was as before received in a friendly manner by the natives, all of whom were seated in a circle on a beautiful spot of grass near a high point of land. Mr Bowen and all the crew consisting of 5 men and the boy, Mr Brabyn, went up with their dinners in their hands and sat down in the midst of them (18 in number) and began to eat showing the natives how to eat bread etc., and gave them anything they chose to ask for. Mr Bowen gave them all the things I had sent as well as several of his own things – stripping himself almost naked to comply with their wishes, and his example was followed by the whole of the boat’s crew. As there was two fine-looking boys amongst them I sent Mr Brabyn on shore purposely to see and gain their confidence by his attention to their youngsters, both of whom he dressed in his shirts, handkerchiefs, trowsers, etc.

All matters continued in this state while our people had anything to give and all we got was 2 spears, a basket and a mogo and even these they again took from the seamen that had them in keeping, this however the officer took no offence at[,] being determined if at all possible to keep on friendly terms with them. It was in vain that the officer and crew tried by signs too significant not to be understood to gain intelligence where water was to be found or on what beaches shells were most plentiful, to all such enquiries they turned a deaf ear and only seemed intent in getting what our people had[,] even to the last shirt; by this time our people had nearly finished their dinners and Isaac Moss having the boat in charge got up and was walking slowly down to her. At this time the Boy Brabyn happened to turn his head towards the wood and saw a man in the very act of throwing a spear at Moss[,] as well as a large body (not before seen) behind a large fallen tree with their spears all in readiness for throwing. The boy immediately cried out to Mr Bowen who was at that very time in the act of serving out bread to all the party he was sitting among that he would be speared, but before the words were out of his mouth, a spear of a most dangerous kind, was thrown at and did not escape Moss by a yard and in an instant the whole of the treacherous body that Mr Bowen and 4 of our people were sitting in the midst of[,] opened out to the right and left and at once left them all open to the party in ambush who immediately were on their feet and began to throw spears; still such was the forbearance of the officer that only one piece was fired over their heads but this was found

333 mogo: hatchet.
only to create a small panic, and our party were obliged to teach them by fatal experience the effect of our walking sticks.

The first fire made them run and one received two balls between his shoulders, still some of them made a stop to heave; the second fire they all set off with astonishing speed and most likely one received a mortal wound. Before another piece was fired Mr Bowen laid hold of one of their number and held on till three of our people came up and also grappled him, strange to tell he made such violent struggles as to get away from them all [,] nor did the contents of the officer’s piece bring him up [,] although one ball passed through his arm and the other in the side – he was traced a good distance by his blood – the remaining pieces were by this time fired and our party gave chase to them all.

On board I kept a strict look-out with the glass and we lay only a little more than a quarter of a mile off the point where they were seated on. I plainly saw the natives running through the wood which was by no means thick – one fellow in particular had been dressed in one of my white shirts and the officer had tied the wrists of it with string, which hindered his getting it off – him we plainly saw from the vessel pass the roots of black trees with such speed as more to resemble a large white bird flying than a man. To increase their panic as they passed along I gave them a discharge of our [ship's] guns loaded with round [shot] and grape[-shot] [,] but am almost certain that they did them no damage; by this time our people returned from the chase, having found on the way back a number of spears, dresses and baskets, etc. Made the boat signal and they came off.

Thus did this treachery and unprovoked attack meet with its just punishment and at the same time taught us a useful lesson to be more cautious in future. With respect to the size of these natives they are much the same as at Sydney, their understanding better though, for they easily made out our signs when it answered their purposes or inclination. When it did not they could be dull enough. They were all clothed in opossum skins and in each basket a certain quantity of gum was found. Not the least sign of a canoe has been seen. I conclude they live entirely inland, and if we may judge from the number of their fires and other marks [,] this part of the country is not thin of inhabitants. Their spears are of various kinds and all of them more dangerous than any I have yet seen. The workmanship of their dresses, their lines and baskets are far from despicable, their mogo or stone axes are such as common at Sydney...

Thursday 18 February… I took a long range through the woods attended with an armed party. We discovered nothing new but found several of the things we gave the natives which in their fright they had dropped...

Friday 19 February… Numbers of native tracks, fires and huts were seen. One native fire in sight on Arthur’s Seat distant about 10 miles.

Saturday 20 February… A red waistcoat of Mr Brabyn’s was found with some bread in each pocket, in this he had dressed one of the native boys, who in his fear left it I fancy, as soon as he had found how to get it off, for it was buttoned on him.

…Thursday 25 February… [after a gale with squalls of rain:] … Observed several very large native fires at the foot of Arthur’s Seat and on the western side of the port...

…Saturday 27 February… A number of very large native fires on the hills round the eastern and western shores of the Port have been seen these two days past...
…Saturday 6 March…This day has been so clear that we are able to see the land all round the Port and in many places very high headlands. In those low places, where we could not be certain of the land by the eye there were numerous native fires and some of them very large…

…Wednesday 10 March. For these last two or three days great numbers of native fires have been seen all round the Port except between Arthur’s Seat and Point Palmer.”

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AN ENCOUNTER WITH 200 ± NATIVES OF PORT PHILLIP, AS DESCRIBED BY
LIEUTENANT J. H. TUCKEY OF H.M.S. CALCUTTA

The N.W. side of the port, where a level plain extends to the northward as far as the horizon, appears
to be by far the most populous; at this place, upwards of two hundred natives assembled round the
surveying boats, and their obviously hostile intentions made the application of fire-arms absolutely
necessary to repel them, by which one native was killed, and two or three wounded. Previous to this
time, several interviews had been held with separate parties, at different places, during which the most
friendly intercourse was maintained, and endeavoured to be strengthened on our part, by presents of
blankets, beads, &c. At these interviews they appeared to have a perfect knowledge of the use of
fire-arms; and as they seemed terrified even at the sight of them, they were kept entirely out of view.
The last interview which terminated so unexpectedly hostile, had at its commencement the same
friendly appearance. Three natives, unarmed, came to the boats, and received fish, bread, and
blankets. Feeling no apprehension from three naked and unarmed savages, the First Lieutenant
proceeded with one boat to continue the survey, while the other boat’s crew remained on shore to
dress dinner and procure water. The moment the first boat disappeared the three natives took leave,
and in less than an hour returned with forty more, headed by a chief who seemed to possess much
authority. This party immediately divided, some taking off the attention of the people who had charge
of the tent, (in which was Mr. Harris the surveyor of the colony,) while the rest surrounded the
boats, the oars, masts, and sails of which were used in erecting the tent. Their intention to plunder
was immediately visible, and all the exertions of the boat’s crew were insufficient to prevent their
possessing themselves of a tomahawk, an ax, and a saw. In this situation, as it was impossible to get
the boat away, every thing belonging to her being on shore, it was thought advisable to temporise, and
wait the return of the other boat, without having recourse to fire-arms, if it could possibly be avoided;
and for this purpose, bread, meat, and blankets were given them. These condescensions, however,
seemed only to increase their boldness, and their numbers having been augmented by the junction of
two other parties, amounted to more than two hundred. At this critical time the other boat came in
sight, and observing the crowd and tumult at the tent, pushed towards them with all possible dispatch.
Upon approaching the shore, the unusual warlike appearance of the natives was immediately
observed, and as they seemed to have entire possession of the tent, serious apprehensions were
entertained for Mr. Harris and two of the boat’s crew, who it was noticed were not at the boat. At the
moment that the grapnel was hove out of the Lieutenant’s boat, to prevent her taking the ground, one
of the natives seized the master’s mate, who had charge of the other boat, and held him fast in his
arms, a general cry of “Fire, Sir; for God’s sake, fire!” was now addressed from those on shore to the
First Lieutenant. Hoping the report only would sufficiently intimidate them, two muskets were fired
over their heads; for a moment they seemed to pause, and a few retreated behind the trees, but
immediately returned, clapping their hands, and shouting vehemently. Four musquets with buck shot,
and the fowling-pieces of the gentlemen with small shot, were now fired among them, and from a
general howl, very different from their former shouts, many were supposed to be struck. This
discharge created a general panic, and leaving their cloaks behind, they ran in every direction among
the trees. It was hoped the business would have terminated here, and orders were, therefore, given to
strike the tent, and prepare to quit the territory of such disagreeable neighbours. While thus
employed, a large party were seen again assembling behind a hill, at the foot of which was our tent:

335 This description of the encounters (in October 1803) is taken verbatim from Tuckey’s published book An Account of a
Voyage… Another version is to be found in Tuckey’s Memoir of a Chart of Port Philip edited by John Currey, who states
that it seems likely that the encounters took place near present-day Point Cook, probably within the territory of the
Wurundjeri tribe. Earlier, Labilliere implied that the encounters took place near the head of the Geelong arm of Port
Phillip.
336 First Lieutenant: that is, the writer, James Hingston Tuckey (1776-1816), himself.
337 Harris: that is, George Prideaux Robert Harris (1775-1810).
338 master’s mate: William S. Gammon.
they advanced in a compact body to the brow of the hill, every individual armed with a spear, and some, who appeared to be attendants of others, carrying bundles of them; when within an hundred yards of us they halted, and the chief, with one attendant, came down to the tent, and spoke with great vehemence, holding a very large war spear in a position for throwing. The First Lieutenant, wishing to restore peace if possible, laid down his gun, and advancing to the chief, presented him with several cloaks, necklaces, and spears, which had been left behind on their retreat; the chief took his own cloak and necklace, and gave the others to his attendant. His countenance and gestures all this time betrayed more of anger than fear, and his spear appeared every moment upon the point of quitting his hand. When the cloaks were all given up, the body on the hill began to descend, shouting and flourishing their spears. Our people were immediately drawn up, and ordered to present their musquets loaded with ball, while a last attempt was made to convince the chief, that if his people continued to approach they would be immediately fired upon. These threats were either not properly understood, or were despised, and it was deemed absolutely necessary for our own safety, to prove the power of our fire-arms, before they came near enough to injure us with their spears; selecting one of the foremost, who appeared to be most violent, as a proper example, three musquets were fired at him at fifty yards distance, two of which took effect, and he fell dead on the spot, the chief turning round at the report saw him fall, and immediately fled among the trees; a general dispersion succeeded, and the dead body was left behind.

Among these savages, gradations of rank could be distinctly traced, founded most probably upon personal qualities and external appearance. In these respects the chief far excelled the rest; his fire was masculine and well-proportioned, and his air bold and commanding. When first he was seen approaching the boat, he was raised upon the shoulders of two men, and surrounded by the whole party, shouting and clapping their hands. Besides his cloak, which was only distinguished by its superior size, he wore a necklace of reeds, and several strings of human hair over his breast. His head was adorned with a coronet of the wing-feathers of the swan, very neatly arranged, and which had a pleasing effect. The faces of several were painted with red, white, and yellow clays, and others had a reed or bone ran through the septum of the nose, perhaps increasing in length according to rank, for the chief’s was by far the longest, and must have measured at least two feet. Ornamental scars on the shoulders were general, and the face of one was deeply pitted as if from the small-pox, though that disease is not known to exist in New Holland. A very great difference was observed in the comparative cleanliness of these savages; some of them were so abominably beastly, that it required the strongest stomach to look on them without nausea, while others were sufficiently cleanly to be viewed without disgust. The beards, which are remarkably bushy, in the former were allowed to grow, while in the latter they were cut close, apparently by a sharp instrument, probably a shell.

339 [Tuckey’s footnote] In viewing the manners of man in his most savage state, in which a cultivated mind sees only disgusting images of wretchedness, we yet cannot fail to notice that universal principle, which seems to act with equal force upon the refined courtier of Europe and the wandering savage of the desert. The Parisian beau cannot take greater pains in adjusting his hair, or perfuming himself with the odours of the East, than the savage does in bedaubing his face with clays, or anointing his skin with the blubber of the whale. To carry the proof yet farther, we find that savages who are unacquainted with the adventitious ornaments of dress, have recourse to various methods of altering the natural forms of the limbs or features, or to marking the body with scars, punctures, &c. which they deem highly ornamental. Among some tribes the head is flattened, among others it is rendered more convex, but the nose and ears are the chief objects of their personal vanity, and among all the savage tribes I have seen, they undergo some kind of distortion. As these operations are performed in infancy, when the parts are flexible, and capable of taking any form, we are often led to conclude, that to be the natural configuration, which is only the effect of artificial distortion.

340 [Tuckey’s footnote] Two attempts have been made to convey the vaccine matter to New South Wales, one by the Glatton, and the other by the Calcutta, but both failed of success. Are we certain that any advantage would have accrued from the introduction of such a disorder into the colony? Hear what a celebrated writer [James Dunbar LL.D., Professor of Philosophy in the King’s College and University of Aberdeen, Essays on the History of Mankind in Rude and Cultivated Ages, Essay X: Of Man, as the Arbitrer of his own Fortune, London, 1780, p. 345] says on this subject: “Distempers, local in their origin, become more formidable when transplanted, than in their native soil; the small-pox, so little feared in Europe, almost depopulated America, and the plague is much more inveterate when it invades Europe, than in its native East. This is easily accounted for; the human frame is prepared by custom and by climate for the admission of the native disease, which is not the case where it is transported.” What opinion would we form of an attempt to introduce a new disease into England, merely to prevent the evils attending the possible introduction of the plague!
The only covering they make use of, to preserve their persons from the winter’s cold, is a square cloak of opossum skins, neatly sewed together, and thrown loosely over their shoulders; the fleshy side, which is worn inwards, is marked with parallel lines, forming squares, lozenges, &c. and sometimes with uncouth human figures in the attitudes of dancing.

Their arms are spears, used with a throwing stick, like those of Port Jackson; their shields are made of a hard wood and neatly carved; their war-spears are barbed with pieces of white spar, or shark’s teeth, fastened on with red gum, and within a certain distance must be very dangerous offensive weapons. Their fish-gigs are pointed with the bone of the kangaroo, and with them they strike the rays which lay in shoal water. We saw no fish-hooks, nor other implements for fishing in deep water, nor any appearance of canoe, or other water conveyance. Their food consists chiefly of shell-fish, and their ingenuity in procuring more substantial aliment, seems confined to the construction of a rude trap, upon the projecting points of the harbour, where the water-fowl lighting at night are entangled and caught. The scarcity of food must at times reduce them to great extremities. If they ever quit the vicinity of the water, their sole subsistence must be on lizards, grubs, and the few opossums they may be able to kill: for the kangaroo, both by its activity and wariness, I should suppose to be out of the reach of their weapons, or their ingenuity. The skins of these animals having never been seen with the natives corroborates this opinion, and it is probable, that the bones with which their fish-gigs are pointed, are those of animals which have died a natural death. That they scruple not to eat lizards and grubs, as well as a very large worm found in the gum-trees, we had ocular demonstration; indeed the latter they seem to consider a very great delicacy. Bread, beef, and fish, which they received from us, they devoured with great eagerness, swallowing large pieces without chewing, as if afraid of its being taken from them, but in no instance could we get them to drink. Spirits they appeared to dislike from the smell alone, and sweet punch they would taste and spit out again with disapprobation. They chew the green leaves of various plants, several of which had a slight astringent taste, and an aromatic smell.

Their huts merely serve the purpose of temporary shelter from the weather. They are constructed of branches of trees placed slanting and open on one side, which is always to leeward; if a fallen tree is near, it usually serves to support the hut, and sometimes when coarse grass is convenient, it is interwoven with the branches. Their fires are made at the very entrance of the huts, and if the wind shifts must be immediately removed. We had no opportunity of observing their method of first kindling a fire, as the parties we saw had always a fire-brand with them, by which, and a little grass, they soon made a “roaring blaze.”

The only traces of society we could observe, was in a cluster of five huts, near which a well of brackish water was probably the only inducement to so close a neighbourhood. How they supply themselves with water in general we were at a loss to guess, for, upon the closest examination, none was found within several miles of the place where they had constructed their huts.

We had a sufficient proof of their burying their dead, by finding a human skeleton three feet under ground, while digging for water; its decayed state evinced its having been in the ground long before the arrival of any European at this port.

The only domestic utensil observed among them was a straw basket, made with tolerable neatness. Their cookery is confined to broiling, in which they are not very delicate; for the fish they sometimes received from us were put on the fire, and devoured without the useless preparation of gutting, cleaning, &c. Blankets they received with much satisfaction; but though several to whom they were given paid us visits afterwards, their blankets were always left behind, and they presented themselves

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341 opossum [sic, possum]
342 fish-gig: a kind of fish-spear.
343 [Tuckey’s footnote] I have since been informed, that canoes were found on the [Yarra] river at the head of the port.
shivering with cold. This manœuvre might probably have been intended to induce a repetition of the gift, unless we suppose them to have been given to their women, which would argue a degree of civilization, from which they are immeasurably removed. Though in our first interviews they seemed to be stupidly devoid of curiosity, and viewed our persons and boats with the most perfect indifference, yet their latter conduct shews, that many of our conveniences appeared valuable, and fear was at last found much more powerful in deterring them from appropriating those things to themselves, than any idea of right or wrong.

The natives of this part of New South Wales appear to differ very little from those in the vicinity of Port Jackson; the same cast of features bespeaks the same origin; their arms, their ornaments, and their dances, are much alike, and they seem to differ only in language, and in the ceremony of knocking out a front tooth of every male, those of Port Philip having their jaws perfect. One woman only was seen, who retired by desire of the men on our approach, and one boy paid us a visit, from whose conduct we could not infer the existence of a great degree of subordination, founded on difference of age; this youngster was more loquacious and troublesome than the men.

Nothing could offer a more perfect picture of reposing solitude, than the wilds of Port Philip on our first arrival. Here Contemplation, with her musing sister Melancholy, might find an undisturbed retreat. Often at the calm hour of evening I have wandered through the woods,

Where the rude ax with heaved stroke
Was never heard the nymphs to daunt,
Or fright them from their hallow’d haunts.344

The last hymn of the feathered choiristers to the setting sun, and the soft murmurs of the breeze, faintly broke the death-like silence that reigned around; while the lightly trodden path of the solitary savage, or the dead ashes of his fire, alone pointed out the existence of human beings. In the course of a very few weeks the scene was greatly altered; lanes were cut in the woods for the passage of the timber carriages…

References:

James Hingston Tuckey, An Account of a Voyage to Establish a Colony at Port Philip in Bass’s Strait, on the South Coast of New South Wales, in His Majesty’s Ship Calcutta, in the years 1802-3-4. By J. H. Tuckey, Esq. First Lieutenant of the Calcutta, Longman, Hurst, Rees, and Orme, London, and J. C. Mottley, Portsmouth, 1805, pp. 167-86. Ferguson 418, 419; also mentioned at 381.


## APPENDIX VIII

### SHIP AND BOAT TYPES MENTIONED IN THE NARRATIVE

<table>
<thead>
<tr>
<th>ENGLISH NAME</th>
<th>FRENCH NAME</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>armed survey vessel</td>
<td>Lady Nelson*</td>
<td></td>
</tr>
<tr>
<td>armed vessel</td>
<td>Porpoise</td>
<td></td>
</tr>
<tr>
<td>Bark</td>
<td>Endeavour</td>
<td></td>
</tr>
<tr>
<td>Barque</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brig</td>
<td>Lady Nelson*, Stirlingshire, Henry</td>
<td></td>
</tr>
<tr>
<td>colonial brig</td>
<td>Dragon, Amity</td>
<td></td>
</tr>
<tr>
<td>colonial-built schooner</td>
<td>goëlette</td>
<td>Cumberland, Casuarina</td>
</tr>
<tr>
<td>colonial-built sloop</td>
<td>Norfolk</td>
<td></td>
</tr>
<tr>
<td>Cutter</td>
<td></td>
<td>with Investigator</td>
</tr>
<tr>
<td>Dinghy</td>
<td>canot</td>
<td>with Géographe</td>
</tr>
<tr>
<td>East Indiaman [= armed merchant ship built for the East Indies route]</td>
<td>Sydney Cove</td>
<td></td>
</tr>
<tr>
<td>Frigate</td>
<td>frégate</td>
<td>with Lady Nelson</td>
</tr>
<tr>
<td>Gig</td>
<td></td>
<td>with Lady Nelson</td>
</tr>
<tr>
<td>jolly-boat</td>
<td></td>
<td>with Lady Nelson</td>
</tr>
<tr>
<td>Launch</td>
<td></td>
<td>with Sydney Cove, with Lady Nelson</td>
</tr>
<tr>
<td>Longboat</td>
<td></td>
<td>Harbinger, Margaret</td>
</tr>
<tr>
<td>merchant brig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>merchantman [non-naval vessel]</td>
<td>Ocean</td>
<td></td>
</tr>
<tr>
<td>Pinnace</td>
<td></td>
<td>with Rattlesnake</td>
</tr>
<tr>
<td>Sloop</td>
<td></td>
<td>Investigator, Bee, Rattlesnake</td>
</tr>
<tr>
<td>sloop of war</td>
<td>corvette</td>
<td>le Géographe, le Naturaliste, La Coquille = L’Astrolabe</td>
</tr>
<tr>
<td>whale-boat</td>
<td>une chaloupe ouverte de baleiniers [= a whalers’ open rowing boat]</td>
<td>Bass’ whale-boat</td>
</tr>
</tbody>
</table>

* the *Lady Nelson* had three sliding keels
The ‘Pacific Australia New Zealand’ Index Book at the UKHO is organised according to locations. Those locations: including, relating to, or adjacent to, the Victorian coastline and Victorian islands appear to be as follows:

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<td>230</td>
<td>Bass Strait</td>
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<td>Bass Strait – Wilson Prom'y. &amp;c.</td>
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<tr>
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<td>Wilson Prom'y. to P. Western</td>
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<td>P. Western to P. Phillip</td>
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<td>P. Phillip</td>
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<td>242</td>
<td>P. Phillip to C. Otway</td>
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<td>244</td>
<td>Bass Strait</td>
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<tr>
<td>246</td>
<td>Bass Strait - Tasmania</td>
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<tr>
<td>254</td>
<td>Tasmania, North Coast</td>
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<td>256</td>
<td>Bass Strait, King I. &amp;c.</td>
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<td>258</td>
<td>C. Otway to Warrnambool</td>
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<tr>
<td>260</td>
<td>Belfast to Guichen B.</td>
</tr>
</tbody>
</table>

Fig. 50. Victorian (and Neighbouring) Locations covered by the ‘Pacific Australia New Zealand’ Index Book at the UKHO.

At the very limited time at his disposal in 2008, the writer managed to inspect and describe in detail twenty-seven historic charts, including thirteen from the list below. It is apparent that significantly more work is required to inspect and describe all historic charts held at the UKHO relating to Victoria.
<table>
<thead>
<tr>
<th>Page in Index</th>
<th>Off. Mark.</th>
<th>Shelf.</th>
<th>Scale.</th>
<th>TITLE.</th>
<th>Nature of Plan, Authority, and Date.</th>
</tr>
</thead>
<tbody>
<tr>
<td>164</td>
<td>L8827</td>
<td>Xi</td>
<td>d=1.65</td>
<td>South Eastern Australia – South of 27° S East of 137° E</td>
<td>(m. p.) Arrowsmith 1838</td>
</tr>
<tr>
<td>166</td>
<td>D1118</td>
<td>Xa</td>
<td>m=0.6</td>
<td>Hopkins R. to R. Shaw</td>
<td>(col. m. p.) 1854</td>
</tr>
<tr>
<td>166</td>
<td>L4290</td>
<td>Xa</td>
<td>m=0.13</td>
<td>Glenelg R. to Murray R. - topography</td>
<td>(col. tr.) 1844</td>
</tr>
<tr>
<td>170</td>
<td>Y 46/1-2</td>
<td>Xr</td>
<td>d=0.66</td>
<td>Australia &amp; Tasmania – Com. M. Flinders 1788-1803</td>
<td>(ch.) Com. M. Flinders 1804</td>
</tr>
<tr>
<td>170</td>
<td>Flinders Atlas</td>
<td>Plate I</td>
<td>d=0.66</td>
<td>Australia &amp; Tasmania – Com. M. Flinders 1788-1803</td>
<td>(p.) Com. M. Flinders 1804</td>
</tr>
<tr>
<td>170</td>
<td>D7011</td>
<td>Xd</td>
<td>d=0.46</td>
<td>Australia &amp; Tasmania – by Freycinet</td>
<td>(Fr. p. 627)</td>
</tr>
<tr>
<td>170</td>
<td>B560/1-2</td>
<td>Xd</td>
<td>d=1.0</td>
<td>Torres Strait to Tasmania, with plans</td>
<td>(p.) Lawrie &amp; Whittle 1798</td>
</tr>
<tr>
<td>170</td>
<td>525</td>
<td>Xd</td>
<td>d=1.1</td>
<td>Torres Strait to Tasmania, South Pt.</td>
<td>(ch.)</td>
</tr>
<tr>
<td>170</td>
<td>C13</td>
<td>Australia folio</td>
<td>d=1.1</td>
<td>Torres Strait to C. Howe – by Lieut. J. Cook “Endeavour” 1770</td>
<td>(p.)</td>
</tr>
<tr>
<td>170</td>
<td>B3804/1-4</td>
<td>63</td>
<td>d=4.5</td>
<td>Torres Strait to C. Howe – by Lieut. J. Cook “Endeavour” 1770</td>
<td>(tr.)</td>
</tr>
<tr>
<td>170</td>
<td>593</td>
<td>69</td>
<td>d=4.5</td>
<td>Torres Strait to C. Howe – by R. Molyneux “Endeavour” 1770</td>
<td>(ch.)</td>
</tr>
<tr>
<td>172</td>
<td>y47/3</td>
<td>Xr</td>
<td>d=3.3</td>
<td>Lat. 21° S. to 33° S. - compilation</td>
<td>(ch.) Lieut. M. Flinders “Reliance” 1800</td>
</tr>
<tr>
<td>172</td>
<td>y48/6</td>
<td>Xr</td>
<td>d=4.9</td>
<td>P. Stephens to C. Howe</td>
<td>(ch.) Com. M. Flinders “Investigator” 1798-1807</td>
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<tr>
<td>172</td>
<td>541/2</td>
<td>Historical Press</td>
<td>d=7.4</td>
<td>Botany B. to Lat. 38°10′ S.</td>
<td>(ch.) R. Pickersgill “Endeavour” Lieut. J. Cook 1770</td>
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<tr>
<td>172</td>
<td>y49/1</td>
<td>Xr</td>
<td>d=3.8</td>
<td>Hunter R. to Lat. 44° S., including Tasmania</td>
<td>(ch.) Lieut. M. Flinders “Reliance” 1798-9</td>
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<td>172</td>
<td>y48/7</td>
<td>Xr</td>
<td>m=0.2</td>
<td>Lat. 33° S. to 37° S.</td>
<td>(ch.) Com. M. Flinders “Investigator” 1798-1803</td>
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<tr>
<td>172</td>
<td>y48/8</td>
<td>Xr</td>
<td>m=0.21</td>
<td>Lat. 37° S. to 39° S. – Twofold B. to Corner Inlet</td>
<td>(ch.) Com. M. Flinders “Investigator” 1798-1803</td>
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<td>172</td>
<td>y48/9</td>
<td>Xr</td>
<td>d=5.2</td>
<td>Bass Strait</td>
<td>(ch.) Com. M. Flinders “Investigator” 1802-3, 1811</td>
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<td>Off. Mark.</td>
<td>Shelf.</td>
<td>Scale.</td>
<td>TITLE.</td>
<td>Nature of Plan, Authority, and Date.</td>
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<td>172</td>
<td>Flinders Atlas</td>
<td>Plate VI</td>
<td>d=5.2</td>
<td>Bass Strait</td>
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<td>Bass Strait</td>
<td>(ch.) Com. M. Flinders “Investigator” 1802-3</td>
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<tr>
<td>172</td>
<td>740</td>
<td>Xp</td>
<td>d=5.7</td>
<td>Bass Strait</td>
<td>(ch.) Lieut. J. Murray “Lady Nelson” 1802</td>
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<tr>
<td>172</td>
<td>y64</td>
<td>X</td>
<td>d=3.9</td>
<td>Bass Strait – track of “Harbinger” 1800-1 – Capt. J. Black</td>
<td>(ch.)</td>
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<td>174</td>
<td>y39</td>
<td>X</td>
<td>d=3.9</td>
<td>Bass Strait – tracks of “Harbinger” 1800-1 &amp; “Margaret” 1801 – Capt. J. Buyers</td>
<td>(ch.)</td>
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<td>174</td>
<td>D7014</td>
<td>Xa</td>
<td>d=5.3</td>
<td>Bass Strait, with Freycinet’s tracks 1802-3</td>
<td>(Fr. p. 632 [652?]) 1803</td>
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<tr>
<td>174</td>
<td>y49/3</td>
<td>Xr</td>
<td>d=5.5</td>
<td>Tasmania, including Furneaux Group &amp; King I.</td>
<td>(ch.) Lieut. M. Flinders “Norfolk” 1798-9</td>
</tr>
<tr>
<td>174</td>
<td>y49/4</td>
<td>Xr</td>
<td>d=5.5</td>
<td>Tasmania, including Furneaux Group &amp; King I.</td>
<td>(ch.) Lieut. M. Flinders “Norfolk” 1798-9</td>
</tr>
<tr>
<td>174</td>
<td>y50/2-3</td>
<td>Xr</td>
<td>d=5.0</td>
<td>C. Otway to Encounter B.</td>
<td>(ch.) Com. M. Flinders “Investigator” 1802</td>
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<tr>
<td>174</td>
<td>Flinders Atlas</td>
<td>Plate V</td>
<td>d=5.0</td>
<td>C. Otway to Encounter B.</td>
<td>(p.) Com. M. Flinders “Investigator” 1802</td>
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<tr>
<td>228</td>
<td>y48/8</td>
<td>Xr</td>
<td>m=0.21</td>
<td>Twofold B. to Corner Inlet</td>
<td>(ch.) Com. M. Flinders “Investigator” 1798-1803</td>
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<td>228</td>
<td>y49a</td>
<td>X</td>
<td>m=1.2</td>
<td>Twofold B. to Corner Inlet</td>
<td>(pl.) Lieut. M. Flinders 1798</td>
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<td>228</td>
<td>y48/9</td>
<td>Xr</td>
<td>m=0.5</td>
<td>Twofold B. to Corner Inlet</td>
<td>(pl.) Lieut. M. Flinders 1798</td>
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<td>228</td>
<td>B522</td>
<td>X</td>
<td>m=1.2</td>
<td>Twofold B. to Corner Inlet – by Lieut. M. Flinders 1798</td>
<td>(p.) Arrowsmith 1801</td>
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Fig. 51. Summary of Charts relating to Victoria listed on Pages 164-228 of the ‘Pacific Australia New Zealand’ Index Book at the UKHO.  
(Note: Charts listed on Pages 230-260 not listed here.)
APPENDIX X

VICTORIA’S MARITIME BOUNDARIES

1. HISTORICAL LEGAL APPROACH

The lateral offshore boundaries between Victoria and the adjoining mainland states have not been defined, even though some attempts have been made to define the eastern limit of New South Wales and the southern limit of South Australia. However, the northern boundary of Van Diemen’s Land (Tasmania) was defined in 1825 as latitude 39º 12′ South, and this has generally been accepted as the southern limit of Victoria’s jurisdiction; the parallel lies about 7 km off Wilson’s Promontory.

The Territory (now State) of New South Wales extends eastwards to include

‘all the islands adjacent to the Pacific Ocean’

while in the most recent Letters Patent constituting the office of Governor of New South Wales, the eastern boundary of New South Wales (excluding Lord Howe Island) is given as the 154º of east longitude, including all the islands adjacent in the Pacific Ocean west of this meridian.

The Province (now State) of South Australia is bounded on the south by

‘the Southern Ocean, … including therein all and every the Bays and Gulfs thereof, together with the Island called Kangaroo Island, and all and every other Islands adjacent to the said last-mentioned Island, or any Part of the Main Land of the said Province…’

while in the most recent Letters Patent constituting the office of Governor of South Australia, the southern limit is defined as

‘the Southern Ocean, including all and every the gulfs, bays, creeks, rivers, and islands (including Kangaroo Island) adjacent to any part of the mainland’

within the meridians of 129º and 141º of east longitude.

By an order-in-Council dated 14 June 1825, made pursuant to Imperial Act 4 George IV c. 96 of 19 July 1823, Van Diemen’s Land (Tasmania) was separated from New South Wales, and erected into a separate Colony, the Order-in-Council taking effect from the date of the proclamation thereof. In the Proclamation, which was issued at Hobart by the Lieutenant-Governor of Van Diemen’s Land and its dependencies, and dated 3 December 1825, the boundaries were described as:

‘…the said island and all islands and territories lying to the southward of Wilson’s Promontory, in thirty-nine degrees and twelve minutes of south latitude,…and between the one hundred and fortieth and one hundred and fiftieth degree of longitude, east of Greenwich,…’

The Lieutenant-Governor’s commission, previously issued by Letters Patent dated 16 July 1825, described his territorial jurisdiction in a similar way.

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345 Royal Commission to Governor Phillip issued to him on 12 October 1786, amplified on 2 April 1787.
347 Imperial Act 1 & 2 Victoriæ c. 60 of 31 July 1838.
In the same year (1825) the Commission to the Governor of New South Wales altered the southern boundary of his jurisdiction to:

‘…the southern extremity of the said Territory of New South Wales or Wilson’s Promontory, in the latitude of 39 degrees 12 minutes south,…’

[The change of name from Van Dieman’s Land to Tasmania was effected by Proclamation of 1 January 1856, made pursuant to an Order-in-Council dated 21 July 1855.]

By Imperial Act 13 & 14 Victoriæ c. 59 of 5 August 1850, the Colony of Victoria was separated from New South Wales, and the issue of writs on 1 July 1851 for election of members of Council for Victoria, was the legal symbol of separation from New South Wales. The land boundaries of the new colony were described in this Act but no southern boundary was defined.

The northern limit of Tasmania’s jurisdiction is generally recognised as being the parallel of 39º12’ south latitude, between the 140º and 150º meridians of east longitude (having been described as such in the Proclamation mentioned above), notwithstanding the fact that Imperial Act 18 & 19 Victoriæ c. 54 of 16 July 1855 defines the Colony of New South Wales as:

‘…Northward of the Fortieth Degree of South Latitude, including all the Islands adjacent in the Pacific Ocean within the Latitude aforesaid,…, save and except the Territories comprised within the Boundaries of the Province of South Australia and the Colony of Victoria, as presently established…’

The current Letters Patent for the Governor of New South Wales (sup.) are worded similarly, but

‘…within the longitudes and latitudes aforesaid…’,

namely, between 129º and 154º of east longitude.

The most recent Letters Patent constituting the office of Governor of Tasmania, declare that Tasmania comprises

‘…and all the islands and territories lying to the southward of Wilson’s Promontory, in the Province of Victoria, in thirty-nine degrees twelve minutes of south latitude’

between the 140º and 150º of longitude east from Greenwich.

The corresponding Letters Patent for the Governor of Victoria state that Victoria comprises

‘the territories bounded on the west by Our State of South Australia, on the South by the sea, and on the east and north by a straight line drawn from Cape Howe to the nearest source of the Murray…’

Consequently, it is theoretically possible for New South Wales to claim sovereignty over the territory above low water line between the parallel of 39º12’ south latitude and low water line along the mainland of Victoria’s coastline. However, in practice Victoria has always exercised jurisdiction over this area (a number of islands having been reserved or alienated under State laws) and apparently New South Wales does not dispute the accuracy of official maps showing the islands as belonging to Victoria. The area

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between the 39º12′ and 40º parallels of south latitude is likewise regarded as Tasmanian territory, and apparently is disputed by neither Victoria nor New South Wales.

By virtue of Imperial Act 24 & 25 Victoriæ c. 44 of 22 July 1861, the various Colonial (*i.e.*, State) Governors are empowered to alter their boundaries by mutual agreement. Similarly, by virtue of Imperial Act 58 & 59 Victoriæ c. 34 of 6 July 1895 and the preamble to the Commonwealth of Australia Constitution Act (in other words, Imperial Act 63 & 64 Victoriæ c. 12), the Queen may, with the consent of the Parliament of the Commonwealth of Australia, alter the boundaries of Australia; however, if the boundaries of any State are thereby altered, section 123 of the Constitution requires such alteration to have the consent of the electors and Parliament of each affected State as well. Finally, Section 111 of the Constitution allows the Parliament of a State to surrender any part of the State direct to the Commonwealth.
2. MODERN INTERNATIONAL APPROACH

Australia’s offshore jurisdiction is comprised of a matrix of Commonwealth and State (and Northern Territory) areas, and the laws in place offshore reflect this. They are jumbled, overlap geographically and by activity, and are generally complex and inefficient.\textsuperscript{351}

What are boundaries, is a matter of law; where they are, is a matter of fact. To this we could add: changes in boundaries must necessarily be determinations on matters of mixed law and fact.

The Imperial Statutes, Commissions, Letters Patent, etc. which define the boundaries of the various colonies of Australia were often vague, sometimes contradictory and presumably concern only ‘dry’ land and inland waters anyway. They were created in an era when no-one appreciated the immense mineral wealth that is to be found offshore, and before the age of oil crises, nuclear submarines, giant super-tankers, offshore oil rigs, untreated sewage and similar pollutants and the dumping of atomic and other wastes in the oceans.

In fact, countries have existed for centuries past with only vague national limits in the adjacent seas without serious political or diplomatic difficulties.\textsuperscript{352} The need for specific marine boundaries, however, has grown rapidly since the beginning of World War II, and recent international conventions have attempted to lay down rules for delimiting the various offshore zones.

The Governor-General, by Proclamation dated 10 September 1953\textsuperscript{353} declared that Australia has sovereign rights over the sea-bed and subsoil of the continental shelf contiguous to any part of its coasts, for the purpose of exploring and exploiting the natural resources of that sea-bed and subsoil, without affecting either the character as high seas of waters outside the limits of territorial waters, or the status of the sea-bed and subsoil that lie beneath territorial waters.

From 1956 to 1958, the United Nations held its first Conference on the Law of the Sea (UNCLOS I) at Geneva, resulting in four treaties concluded in 1958. In accordance with international law, Australia as a coastal state has sovereign rights over the continental shelf beyond the limits of Australian territorial waters for the purpose of exploring it and exploiting its natural resources, these rights being defined in the Convention on the Continental Shelf signed in Geneva on 29 April 1958, to which Australia is a party and under which Australia has obligations.

Australia is also a party to, and has obligations under, the Convention on the Territorial Sea and the Contiguous Zone (also signed at Geneva on 29 April 1958), which spells out the procedure for delimiting baselines for measuring the breadth of these offshore zones (namely, the territorial sea and the contiguous zone), but which left unanswered the question of what is to be the breadth of the territorial sea. Unresolved, too, was the problem of defining and accepting offshore limits of the sovereignty in right of the State and the sovereignty in right of the Commonwealth.

In 1960, the United Nations held a second Conference on the Law of the Sea (UNCLOS II) in Geneva, but this lasted only six weeks and no new agreements were reached.

In 1963 the Parliament of Victoria passed the Undersea Mineral Resources Act (no. 7095) which asserted Victoria’s right to control the exploration and exploitation of the mineral resources of the sea bed and its


\textsuperscript{352} The concept of ‘freedom of the seas’ dates from the 17th century: national rights were limited to a specific belt of water extending from a nation’s coastline, usually three nautical miles, according to the ‘cannon shot’ rule which was developed by the Dutch jurist Cornelius van Bynkershoek (1673-1743), who furthered the idea of an earlier Dutch jurist Hugo Grotius (1583-1645), who wrote \textit{The Free Sea (Mare Liberum)} published in 1609. Cornelius van Bynkershoek’s rule is said to have been based on a calculation by the Italian abbé, Ferdinand Galiani (1728-1787), of the parabolic trajectory of a cannonball.

\textsuperscript{353} \textit{Commonwealth of Australia Gazette}, 11 September 1953, p. 2563.
subsoil over the offshore areas within its jurisdiction, both within and beyond Victoria’s territorial limits, but did not define the extent of that jurisdiction nor the breadth of Victoria’s territorial seas.

In 1967 the parliaments of the Commonwealth and Victoria passed complementary legislation called the Petroleum (Submerged Lands) Act 1967, being Act no. 118 of 1967 and Act no. 7591 respectively, after the governments of the Commonwealth and of the states had decided, in the national interest, that, without raising questions concerning and without derogating from their respective constitutional powers, they should co-operate for the purpose of ensuring the legal effectiveness of authorities to explore for, and to exploit, the petroleum resources of submerged lands adjacent to the Australian coast; namely, the continental shelf including the sea-bed and subsoil beneath territorial waters.

The Commonwealth Government passed the Seas and Submerged Lands Act (no. 161 of 1973), which declared that the sovereignty in respect of the territorial sea of Australia, and in respect of the airspace over it and in respect of its bed and subsoil, is vested in and exercisable by the Crown in right of the Commonwealth. The Act gave the Governor-General power to proclaim the breadth of the territorial sea, and the power to proclaim the baseline from which the breadth of the territorial sea was to be measured. The Act declared that the sovereignty in respect of the internal waters of Australia (that is to say, any waters of the sea on the landward side of the baseline of the territorial sea) not within the limits of a state, and in respect of the airspace over those waters and in respect of the sea-bed and subsoil beneath those waters, to be vested in and exercisable by the Crown in right of the Commonwealth.

Fundamental to the international problem was deciding the limits of national jurisdiction. At talks in Geneva, preparatory to a third UN conference, a majority of nations had moved in favour of 12-nautical-mile territorial limits. Furthermore, most coastal nations, including Australia, wished to create economic zones extending 200 [nautical] miles from their coastlines (or even further where the natural limits of the continental shelf extend beyond 200 [nautical] miles), in which they would have exclusive rights of commercial exploitation of the ocean’s resources.

A third United Nations Conference on the Law of the Sea (UNCLOS III) commenced later in 1973. The Conference, in which 160 states participated, held eleven sessions between 1973 and 1982. The aim of the conference was to produce a coherent and internationally-agreed system of law to control the exploitation of the enormous potential wealth in the oceans and seas, on the deep seabed, and beneath it.

Meanwhile, the Australian States prepared to challenge in the High Court the Commonwealth’s Seas and Submerged Lands Act (no. 161 of 1973), which asserted the Commonwealth’s sovereign rights over the territorial sea and the continental shelf (that is, all offshore waters). Importantly, the High Court in 1975 confirmed that the Commonwealth had jurisdiction and the right to explore for and exploit seabed resources of the territorial sea and continental shelf (i.e. in all offshore waters).

Coastal waters

In June 1979, an agreement was reached between the Commonwealth and the States to a division of offshore rights, powers and responsibilities, known collectively as the Offshore Constitutional Settlement (OCS). Pursuant to the OCS, and under paragraph (xxxviii) of section 51 of the Constitution of the Commonwealth, the Parliaments of all the States of Australia requested the Parliament of the Commonwealth to enact the Coastal Waters (State Title) Act 1980 and the Coastal Waters (State Powers) Act 1980 (and equivalent Acts for the Northern Territory), by which the Commonwealth conferred on the States (and the Northern Territory) the same title to the sea and seabed of the (3-nautical-mile) territorial sea and the same legislative jurisdiction as the States (and the Territory) would have had if that part of the

territorial sea had been within the limits of the States (or the Territory). In other words, the result of the OCS was that, in general, the States have responsibility for coastal waters.

Specifically, section 3 of the *Coastal Waters (State Powers) Act 1980* states:

‘*adjacent area in respect of the State* means, in relation to each State, the area the boundary of which was described under the heading referring to that State in Schedule 2 to the repealed *Petroleum (Submerged Lands) Act 1967* as in force immediately before the commencement of this Act.

*coastal waters of the State* means, in relation to each State:

(a) the part or parts of the territorial sea of Australia that is or are within the adjacent area in respect of the State, other than any part referred to in subsection 4(2); and

(b) any sea that is on the landward side of any part of the territorial sea of Australia and is within the adjacent area in respect of the State but is not within the limits of the State…’

Section 4 of the Act states:

‘4 Extent of territorial sea and coastal waters

(1) For the purposes of this Act, the limits of the territorial sea of Australia shall be the limits existing from time to time, ascertained consistently with the *Seas and Submerged Lands Act 1973* and instruments under that Act and with any agreement (whether made before or after the commencement of this Act) for the time being in force between Australia and another country with respect to the outer limit of a particular part of that territorial sea.

(2) If at any time the breadth of the territorial sea of Australia is determined or declared to be greater than 3 nautical miles [5.556 kilometres], references in this Act to the coastal waters of the State do not include, in relation to any State, any part of the territorial sea of Australia that would not be within the limits of that territorial sea if the breadth of that territorial sea had continued to be 3 nautical miles.’

Australia’s *Territorial Sea* now runs from the baselines out for 12 nautical miles. Under section 7 of the *Seas and Submerged Lands Act*, the Governor-General is given power to declare the outer limits of the whole or any part of the territorial sea. Pursuant to this power, the Commonwealth extended the outer limit of the territorial sea in 1990 from three to 12 nautical miles, but as indicated above, this did not extend the jurisdiction of the States beyond the three-nautical-mile limit agreed under OCS 1979. Also, following the OCS, an amendment confined the application of the then *Petroleum (Submerged Lands) Act 1967* to waters outside the three-nautical-mile limit. Victoria and the other States (and Northern Territory) enacted mirror legislation applying in waters landward of that boundary.

The convention resulting from UNCLOS III came into force on 16 November 1994 and introduced a number of provisions. Amongst other things, the convention set the limit of various areas, measured from a

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carefully defined baseline. (Normally, a sea baseline follows the low-water line, but when the coastline is deeply indented, has fringing islands or is highly unstable, straight baselines may be used.)

The areas defined in the convention include the following:

**Internal waters**

Covers all water and waterways on the landward side of the baseline. The coastal state is free to set laws, regulate use, and use any resource. Foreign vessels have no right of passage within internal waters.

**Territorial waters**

Out to 12 nautical miles (22.224 kilometres) from the baseline, the coastal state is free to set laws, regulate use, and use any resource. Vessels were given the right of innocent passage through any territorial waters, with strategic straits allowing the passage of military craft as transit passage, in that naval vessels are allowed to maintain postures that would be illegal in territorial waters. “Innocent passage” is defined by the convention as passing through waters in an expeditious and continuous manner, which is not “prejudicial to the peace, good order or the security” of the coastal state. Fishing, polluting, weapons practice, and spying are not “innocent”, and submarines and other underwater vehicles are required to navigate on the surface and to show their flag. Nations can also temporarily suspend innocent passage in specific areas of their territorial seas, if doing so is essential for the protection of its security.

**Archipelagic waters**

Part IV of the convention set the definition of Archipelagic States, and also defines how the state can draw its territorial borders. A baseline is drawn between the outermost points of the outermost islands, subject to these points being sufficiently close to one another. All waters inside this baseline are designated Archipelagic Waters. The state has full sovereignty over these waters (like internal waters), but foreign vessels have right of innocent passage through archipelagic waters (like territorial waters).

**Contiguous zone**

Beyond the 12-nautical-mile limit, there are a further 12 nautical miles from the territorial sea baselines limit, the contiguous zone, in which a state can continue to enforce laws in four specific areas: customs, taxation, immigration and pollution, if the infringement started within the state’s territory or territorial waters, or if this infringement is about to occur within the state’s territory or territorial waters. This makes the contiguous zone a hot pursuit area.  

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Fig. 52. Maritime Zones (courtesy Geoscience Australia)
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Baselines

The normal baseline is the line of mean low water (MLW) along that portion of the coast which is in direct contact with the open sea, and closing lines across the mouths of bays and rivers, as delineated on official large-scale charts. The location of a normal baseline will move with changes due to erosion and accretion.

The coastline of Victoria is long and complex, with many irregularities such as inlets and coves, offshore rocks and islands. These irregularities greatly complicated the task of determining the baselines.

The Convention defines a bay as a well-marked indentation whose area is as large as, or larger than, that of a semi-circle whose diameter is a line drawn across the mouth of that indentation. Where islands are within the indentation, their areas are included in the area of the indentation, and the diameter of the semi-circle is defined as the sum of the individual widths of the mouths. For the whole of the bay to be included as internal waters, the distance between the low-water marks of the natural ‘entrance points’ of the bay shall not exceed twenty-four [nautical] miles.

The Convention also defines historic bays, islands and low-tide elevations, all of which influence the final position of the baselines.

A low-tide elevation is a naturally-formed area of land which is surrounded by and above water at low-tide but submerged at high-tide. Where a low-tide elevation is situated wholly or partly at a distance not exceeding the breadth of the territorial sea from the mainland or an island, the low-water line on that elevation may be used as the baseline for measuring the breadth of the territorial sea. Where a low-tide elevation is wholly situated at a distance exceeding the breadth of the territorial sea from the mainland or an island, it has no territorial sea of its own.
Tidal Datum Plane

In the case of Victoria, it is apparent that the outer limits of the territorial sea and the contiguous zone are dependent primarily upon the accurate demarcation of the low-water line along Victoria’s coastline, from which the breadth of the territorial sea is measured. Consequently, the tidal datum plane at mean low water must first be established by observations of the vertical component (using tide gauges), and then the shoreline must be demarcated at the elevation of the tidal datum plane. Thus, unlike most boundary lines, the low-water line has three dimensions, not two.\(^{361}\) So the establishment of boundaries determined by the course of the tides involves two geometrical aspects: a vertical one based on the height reached by the tide during its vertical rise and fall and constituting a tidal ‘plane’ (surface), and a horizontal one relating to the line where the tidal plane intersects the shore to form the boundary desired.

The tidal datum plane is established by observations of the tide over a ‘tidal epoch’ of 6798 days (about 18.6 years) or the time necessary to complete a node cycle, that is, the period for the regression of the moon’s nodes.\(^{362}\) The tidal datum, the very base from which we begin the measurement of seaward boundaries, is not quite constant but rather is a constantly changing reference. Due to glacial-Eustatic and/or plate tectonic effects (‘continental drift’), the datum can change with the choice of a particular 18.6 year epoch.\(^{363}\)

Tides

There are three characteristic features of the tide at a given place: these are the time, range, and type of tide.

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\(^{361}\) As explained further on, Australia has decided to compute its maritime boundaries based on Lowest Astronomical Tide (LAT).

\(^{362}\) Also known as a metonic cycle, after which the phases of the moon recur on approximately the same days of the year as in the previous cycle. Devised by Meton of Athens (Μέτων ὁ Ἀθηναῖος), an astronomer in the fifth century BC.

\(^{363}\) Australian tidal authorities have adopted the 20-year tidal datum epoch 1992 to 2011 (inclusive) as the basis for calculating tidal datum and the associated tidal planes.
The \textit{time of tide} is related to, and can be specified by, the moon’s passage across the meridian, and the delay in the occurrence of the high tide following the moon’s passage, the ‘luni-tidal interval’, which is generally attributed to the effects of friction.

The \textit{range of tide} is the magnitude of the rise and fall of the tide. The range at a given place will vary from day to day, depending on the inter-relationship of the tide-producing forces, especially those of a periodic nature.

The \textit{type of tide} is dependent upon the characteristic form of the daily rise and fall of the tide. The tide is \textit{semi-diurnal} when two similar highs and two similar lows occur each ‘lunar day’ (24 hours 50 minutes on the average). It is \textit{diurnal} when only one high and one low occur in a lunar day. The tide is a \textit{mixed} type when two highs and two low waters occur in a lunar day but with marked inequality between the two high waters or between the two low waters of the day. This ‘diurnal inequality’ varies within each fortnight as it depends primarily on the declination of the moon which varies cyclically with a period of a month.

The relative positions of the sun, moon and earth (and the planets, to a miniscule extent) combine to cause the variations of range and the three types of tide. The \textit{tide-producing force} of a heavenly body varies directly as its mass and inversely as the square of its distance from the earth (Newton’s Law of Universal Gravitation):

\[ F_1 = F_2 = \frac{G m_1 m_2}{r^2} \]

where

- \( F_1 = F_2 \) is the force between the masses,
- \( G \) is the gravitational constant,
- \( m_1 \) is the first mass,
- \( m_2 \) is the second mass, and
- \( r \) is the distance between the centres of the masses.

\textbf{Fig. 55. Newton’s Law of Universal Gravitation}

Consequently, the tide-producing force of the moon is somewhat more than twice that of the sun, and the moon is therefore the primary influence on the tides.

The causes of variations in the tide’s range are either periodic or non-periodic.

\textbf{Periodic causes are:}

1. Moon’s phase (moon’s position relative to the sun’s position);
2. Moon’s parallax (moon’s distance from the earth);
3. Moon’s declination (moon’s angular displacement from the plane of the earth’s equator);
4. Others – such as the sun’s astronomical position, the node of the moon, standing waves (‘seiches’) in bays, etc.

\textbf{Non-periodic causes are:}

1. Weather (especially wind and changes in barometric pressure);
2. Climate (seasonal variations);
3. Underwater and shoreline topography;
4. Others.

Tides are predictable, but waves and storms producing waves are unpredictable.

The tidal characteristics of time, range and type will vary from one location to another as a result of variations in the magnitude and phase of the tide-producing forces and in local hydrographic features.

But while some generalisations about tidal characteristics can be made, it must be recognised that tidal characteristics are a local phenomenon and the description of the tide in one area may not be applicable to another area. Obviously, the closer the placing of tide-measuring devices along the coast, the more accurate will be the interpolated value for the tide at an intermediate location.

**Tide-Measuring Gauges**

There have been tide-measuring gauges at a few stations along the Victorian coast – or inside bays – for many years; for instance, there has been a gauge at Point Lonsdale since 1929, and one at Portland since 1946. Other stations such as at Port Fairy, Flinders, San Remo and Lakes Entrance commenced operating in the 1960s and 1970s. Tide-measuring gauges are a necessity in ports, as they provide information on low tides, enabling port authorities to calculate the extent of channel dredging required to provide safe access for large ships visiting the ports.

Of course, reference to mean low water as a boundary or ‘mark’ necessarily refers to the point at which the surface of average low tide meets the land. To the extent that the land itself moves (as in the case of shifting sands) and the sea level is rising, this line does vary. The common law doctrines of alluvion and avulsion apply to tidal shores as well as to riparian (river), lacustrine (lake) and palustrine (marsh) situations.

In some cases, the land itself moves in greater degree, but with less frequency, than do the tides. Where the land moves gradually and imperceptibly, the doctrine of alluvion applies, the addition of land being accretion, and the loss of land being deliction (erosion). The doctrine of avulsion would apply only if the changes were neither gradual nor imperceptible; but if the changes are constant, in ‘offsetting pairs’ occurring annually, or if they are cyclical and seasonal, the doctrine of avulsion would not apply and a reasonably definite mean line of the shore could be delimited.

The shifting of land boundaries (‘shifting sands’) is caused by the following factors:

1. Tides
2. Currents
3. Waves
4. Meteorological influences (breezes, storms, etc.)
5. Artificial influences (piers, groynes, etc.)
6. Variations in the supply of sediments; and
7. Shoreline transport of sand, and littoral drift of sand, due to wave-induced currents.

The character of the changes may be imperceptible or perceptible, short-term or long-term, cyclical or steady, and the extent of the changes may be predictable or unpredictable.

Having established mean low water by means of long-period observations using tide gauges at selected locations along the coast, the shoreline can then be demarcated at this elevation by employing surveying techniques on the ground, assisted by aerial photography.
It is important for the hydrographic surveyor to determine whether or not a rock in the water within the breadth of the territorial waters is submerged at low water or whether it is exposed above the low water datum, thereby qualifying it as a low-tide elevation and thereby increasing the extent of the territorial waters. In some cases this involves determining the elevation of a rock to an accuracy of 30 mm, taking into account dynamic tidal forces, wave action, etc.

Black-and-white infrared film detects the presence of moisture and is therefore used to capture the water/land interface at the selected instant of the tidal cycle. Ordinary black-and-white film can be used in photogrammetry for aerotriangulation and basic compilation of maps, and for photomosaics, while colour, and colour infrared (‘false colour’), film may be exposed to detect differences in vegetation.

In the past, hydrographic charts of the coastal water areas of Victoria have generally depicted the coastline at approximately mean low water, MLW – as ships should not be at risk of running aground at low tide! – whereas topographic maps of the coastal land areas of Victoria generally delineate mean high water, MHW – as occupiers of land don’t want their lands inundated at high tide!

**Mean Sea Level; Australian Height Datum**

However, from a geodetic point of view, mean sea level (MSL) is the fundamental surface, as it corresponds to the surface of the geoid beyond the coastline. Heights of survey benchmarks throughout Australia are referenced to the Australian Height Datum (AHD), which was obtained in 1971 by the optimisation of mean sea level surfaces at thirty tide gauges around the coast of Australia (after allowing for the curvature of the earth and other mathematical corrections) by adjusting about 195 000 km of spirit levelling across the country.\(^{364}\) However, due to dynamic ocean effects (e.g., winds, currents, atmospheric pressure, temperature and salinity), tide gauge observations spanning a period of only 2-3 years and the omission of observed gravity, MSL was not coincident with the geoid at these tide locations.\(^{365}\)

![Fig. 56. The Victorian Section of the National Levelling Adjustment as at 31st December 1970](image)


\(^{366}\) *The Australian Height Datum (AHD)*, National Mapping Council of Australia (Special Publications 8), n.d. [c. 1971], Annex E (page 2), showing Victorian junction points and tide gauges. Levelling in the original adjustment of 5 May 1971 used in the...
AusGeoid 2009, released in mid-2010, is a more direct and more accurate method of calculating Australian Height Datum (AHD) heights from GPS ellipsoidal heights when compared with previous AusGeoid models. Unlike previous versions, which were based predominantly on the gravimetric geoid, AusGeoid09 includes a geometric component to model the offset between the gravimetric geoid and AHD. This will allow high precision GPS users to compute AHD heights either in real time in the field, or via post processing back in the office to within ± 4 cm across most of Australia; this is an order of magnitude more accurate than previous models.\textsuperscript{367}

**Topographic Mapping**

Topographical mapping at the scale of 1:25 000 of the entire Victorian coast (except for the East Gippsland coast) was completed by February 1992.\textsuperscript{368} The thickness of the line on topographic maps depicting the coastline (ostensibly mean high water) is 0.20 mm, which at the scale of 1:25 000 represents an actual ground width of 5 metres. The National Mapping Council’s *Standards of Map Accuracy*\textsuperscript{369} prescribe that not more than 10% of well-defined points shall be plotted with a horizontal error of more than 0.5 mm; at this scale this represents an actual ground width of 12.5 metres.

The standard contour interval for topographic maps at the scale of 1:25 000 is 10 metres,\textsuperscript{370} the vertical accuracy being such that not more than 10% of points shall be in error by more than half the contour interval (namely, 5 metres). This compares with a maximum tidal range of 3.2 metres predicted for any tide gauge station along Victoria’s coastline. [Recent investigations show that the maximum recorded tidal ranges for Victorian waters in the open sea occur off the western side of Wilson’s Promontory where the range is 2.92 metres, and in the coastal embayments of Western Port, where the range is 3.22 metres near Tooradin, and in Corner Inlet where the range is 3.02 metres at Port Franklin.\textsuperscript{371}]

**Latest Developments in Locating Baselines**

It is foreseeable that greater accuracy standards will be required in the future for the demarcation and delineation not only of the baselines but also the limits of the seaward boundaries, acceptable by all states nationally and all countries internationally.

While photography, bands of vegetation, soil and salinity changes and pH factor are all aids for determining the location of the Mean High Water (MHW) line – which on small-scale maps and charts is indistinguishable from Mean Low Water (MLW) – they are no substitute for long-established tide-measuring gauges and survey.

Modern tide-measuring gauges have been installed along the coastline to establish the position of a number of datum planes. Australia’s maritime boundaries are being computed based on the line of

\textsuperscript{365} Determination of the AHD is called ‘Primary Levelling’ and is shown in black in the figure; levelling not adjusted on 5 May 1971 but subsequently adjusted to the AHD is called ‘Supplementary Levelling’ and is shown in red in the figure. A similar map, but labelling the loops rather than the junction points, is given in Roelse, Granger & Graham, 1975, Annex B.4.


\textsuperscript{367} Although the hard copy 1:25 000 maps have become out-of-date, the digital information underpinning the maps has been kept fully up-to-date. Vicmap’s 1:30 000 scale A4 topographical maps covering the whole of Victoria became available for purchase on-line in PDF format in May 2004. There were 6345 sheets created. The maps were designed so that four of the 1:30 000 scale maps fit into a single existing 1:25 000 scale topographic map.


\textsuperscript{369} In mountainous areas the contour interval is 20 metres.

Lowest Astronomical Tide (LAT)\textsuperscript{372}, which has the advantage of disregarding the effects of extreme meteorological conditions.

Lowest Astronomical Tide is defined as:

‘the lowest tide level which can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions. It is increasingly used as chart datum, for example, for all new Australian charts.’\textsuperscript{373}

[Only the most recent Victorian legislation, such as the \textit{Offshore Petroleum and Greenhouse Gas Storage Act} 2010, refers to Lowest Astronomical Tide as the baseline for measuring the territorial sea.]

In connection with tide predictions for Victorian shores, Figs. 57.1 and 57.2 show the standard ports \textcolor{red}{\textbullet} (Portland, Port Phillip Heads (Point Lonsdale), Geelong, Melbourne (Williamstown), Western Port (Stony Point), Port Welshpool and Lakes Entrance), and secondary ports \textcolor{blue}{\textbullet} (Lorne and Rabbit Island), with tide predictions available.

For other secondary ports \textcolor{blue}{\textbullet} (Port Fairy, Warrnambool, Port Campbell, Apollo Bay, Waratah Bay, Point Hicks and Gabo Island), average time differences are given.\textsuperscript{374}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{port-map.png}
\caption{Ports in Western and Central Victoria currently with Tide-Measuring Gauges. (Image from \url{http://www.bom.gov.au/oceanography/tides/MAPS/vic.shtml#form}.)}
\end{figure}

\textsuperscript{372} Tidal Interface Working Group, \textit{Compendium of Terms}, Inter-governmental Committee on Surveying and Mapping (ICSM), May 2003, p. 54.

\textsuperscript{373} This definition is taken from the \textit{Australian Hydrographic Office Tidal Glossary}, \url{http://www.hydro.gov.au/prodserv/tides/tidal-glossary.htm}, and is repeated in National Tidal Centre, \textit{NTC Glossary - Tidal Terminology}, Bureau of Meteorology, 2010.

\textsuperscript{374} For further information visit the website of the Bureau of Meteorology \url{http://www.bom.gov.au/oceanography/} and follow the links.
Australian Baseline Sea Level Monitoring Project

The National Tidal Centre (NTC) of the Bureau of Meteorology provides the management and operational support to the Australian Baseline Sea Level Monitoring Project with assistance from the Australian Climate Change Science Program. The funding for the project derives from the Commonwealth Government, through the Department of Climate Change and Energy Efficiency. The project is designed to monitor sea level around the coastline of Australia. The ultimate goal is to identify long period sea level changes, with particular emphasis on the enhanced greenhouse effect on sea level.

Fig. 58. Sea Level Monitoring Station SEAFRAME (SEA-level Fine Resolution Acoustic Measuring Equipment) at Portland, one of fourteen standard stations around Australia’s coastline supported by the National Tidal Centre as part of the Australian Baseline Sea Level Monitoring Project.\(^\text{375}\)

SEA-Level Fine Resolution Acoustic Measuring Equipment (SEAFRAME) Gauges

NTC maintains an array of SEA-Level Fine Resolution Acoustic Measuring Equipment (SEAFRAME) stations which measure sea level very accurately, and record meteorological parameters. The array consists of fourteen standard stations around the Australian coastline (including Portland, installed in July 1991), plus two supplementary stations (Lorne and Stony Point, both of which were installed in January 1993) which are owned by port operators.

SEAFRAME gauges not only measure sea level by two independent means, but also observe a number of “ancillary” variables – atmospheric pressure, air and seawater temperatures, wind speed and direction.

Fig. 59. Cross-section of a typical Sea Level and Climate Monitoring Station (Courtesy Bureau of Meteorology, Australian Weather Calendar 2012)

Tidal Constants

The purpose of tidal analysis is to represent the water level or current time series by a set of harmonics, or sinusoidal waves, each of them having a specific amplitude and phase. The set of amplitudes and phases are known as the tidal constants. The official predictions created by the NTC use 112 constants – given that there is at least one year of observations available for analysis.\(^{376}\)

\(^{376}\) It is acknowledged that much of the content in this Appendix X has been condensed from the following publications:

- The Australian Height Datum (AHD), National Mapping Council of Australia (Special Publications 8), n.d. [c. 1971], Annex E (page2).
- Permanent Committee on Tides and Mean Sea Level (PCTMSL), Site Selection Specifications for Tidal Stations, n.d.
- Permanent Committee on Tides and Mean Sea Level (PCTMSL), Instrument Specification for High Precision Sea Level Monitoring Stations, n.d.
- Permanent Committee on Tides and Mean Sea Level (PCTMSL), Tide Gauge Survey Instructions, n.d.
- Permanent Committee on Tides and Mean Sea Level (PCTMSL), Achievements of the Permanent Committee on Tides and Mean Sea Level, n.d. [c. 2000].
- Tidal Interface Working Group, Compendium of Terms, Inter-governmental C’ on Surveying and Mapping (ICSM), May 2003.
- Inter-governmental Committee on Surveying and Mapping, ICSM News – June 2010.
- Permanent Committee on Tides and Mean Sea Level (PCTMSL), Australian Tides Manual version 4.1, Inter-governmental Committee on Surveying and Mapping (ICSM), 2011.
Recent State and Commonwealth Legislation concerning the Offshore Area

In the preamble to Victoria’s *Offshore Petroleum and Greenhouse Gas Storage Act* 2010, the [previously-mentioned] Offshore Constitutional Settlement (OCS) is recited.

Section 4 (3) of the Act states that

‘The offshore area— (a) starts from the baseline from which the breadth of the territorial sea is measured off Victoria; and (b) extends to 3 nautical miles from the baseline from which the breadth of the territorial sea is measured off Victoria.’

Then follows the note

‘Generally, the territorial sea baseline is the line of lowest astronomical tide [LAT] along the coast, but it also encompasses straight lines across bays (bay closing lines), rivers (river closing lines) and between islands, as well as along heavily indented areas of coastline (strait baselines) under certain circumstances.’

In the list of definitions in the Victorian Act,

*Commonwealth defined offshore area* means the offshore area of Victoria as defined by section 8 of the [corresponding] Commonwealth Act [namely, ‘so much of the scheduled area for Victoria as comprises waters of the sea that are:

(a) beyond the outer limits of the coastal waters of Victoria; and

(b) within the outer limits of the continental shelf.’]

whereas *offshore area* means—

(a) that part of the scheduled area for Victoria that consists of the territorial sea; and

(b) any waters that are—

(i) on the landward side of the territorial sea; and

(ii) not within the limits of Victoria; and

(c) if at any time the breadth of the territorial sea of Australia is determined or declared to be greater than 3 nautical miles, the offshore area continues to have effect as if the breadth of the territorial sea of Australia had continued to be 3 nautical miles. [This recognised that many marine countries have claimed the breadth of their territorial seas to be 12 nautical miles.’]

[Another definition in the Victorian Act is that for *datum*, which means a reference frame for defining geographic coordinates.]\(^{377}\)

The Victorian Act uses the *Australian Geodetic Datum* (as defined in *Commonwealth of Australia Gazette*, no. 84, of 6 October 1966, p. 4984) to determine the position of graticular\(^{378}\) sections or blocks, and the *Geocentric Datum of Australia* (as defined in *Commonwealth of Australia Gazette*, no. 35, of 6 September 1995) to determine certain other areas.

\(^{377}\) Note: the offshore area corresponds to the term *the adjacent area* under the repealed Petroleum (Submerged Lands) Act 1982.

\(^{378}\) graticular: pertaining to the graticule (defined by parallels of latitude and meridians of longitude) rather than the grid.
Three simplified maps are shown in the Victorian legislation, the first two, relating to schedule 1 of the Act, illustrating the offshore area, the Commonwealth defined offshore area, and the scheduled area for Victoria. The third map, corresponding to schedule 2 of the Act, shows the area within which is ‘the area to be avoided’.

Fig. 60. First map in Victoria’s *Offshore Petroleum and Greenhouse Gas Storage Act 2010*, s. 5, p. 6.

Fig. 61. Second map in Victoria’s *Offshore Petroleum and Greenhouse Gas Storage Act 2010*, s. 5, p. 7.
SCHEDULED AREA FOR VICTORIA

The scheduled area for Victoria is the area the boundary of which commences at a point that is the intersection of the coastline at mean low water by the boundary between the States of New South Wales and Victoria and runs thence south-easterly along the geodesic to a point of Latitude 37° 34′ 54.39" South, Longitude 150° 10′ 04.43" East:

(a) thence south-easterly along the geodesic to a point of Latitude 40° 39′ 54.14" South, Longitude 158° 53′ 03.98" East; and

(b) thence south-westerly along the geodesic to a point of Latitude 41° 29′ 54.17" South, Longitude 158° 13′ 04.08" East; and

(c) thence north-westerly along the geodesic to a point of Latitude 39° 11′ 54.42" South, Longitude 150° 00′ 04.52" East; and

(d) thence westerly along the loxodrome to a point of Latitude 39° 11′ 54.71" South to its intersection by the meridian of Longitude 142° 30′ 04.95" East; and

(e) thence south-westerly along the geodesic to a point of Latitude 39° 49′ 54.74" South, Longitude 142° 00′ 05.02" East; and

(f) thence south-westerly along the geodesic to a point of Latitude 43° 59′ 55.11" South, Longitude 136° 29′ 05.64" East; and

(g) thence north-easterly along the geodesic to a point of Latitude 38° 40′ 42.76" South, Longitude 140° 40′ 49.00" East; and

(h) thence north-easterly along the geodesic to a point of Latitude 38° 35′ 24.75" South, Longitude 140° 44′ 41.98" East; and

(i) thence north-easterly along the geodesic to a point of Latitude 38° 25′ 54.75" South, Longitude 140° 53′ 04.96" East; and

(j) thence north-easterly along the geodesic to a point of Latitude 38° 14′ 54.73" South, Longitude 140° 57′ 04.94" East; and

(k) thence north-easterly along the geodesic to a point that is the intersection of the parallel of Latitude 38° 09′ 54.73" South by the meridian passing through the intersection of the coastline at mean low water by the boundary between the States of South Australia and Victoria; and

(l) thence north along that meridian to its intersection by the coastline at mean low water; and

(m) thence along the coastline of the State of Victoria at mean low water to the point of commencement.

AREA THAT INCLUDES THE AREA TO BE AVOIDED

The area that includes the area to be avoided is the area the boundary of which commences at the most easterly intersection of the coastline of the State of Victoria at mean low water by the parallel of Latitude 38° 14′ 54.50" South and runs thence south-easterly along the geodesic to the point of Latitude 38° 34′ 54.49" South, Longitude 147° 44′ 04.61" East:

(a) thence south-easterly along the geodesic to the point of Latitude 38° 40′ 54.48" South, Longitude 148° 06′ 04.60" East; and

379 Taken from Schedule 1 of Victoria’s Offshore Petroleum and Greenhouse Storage Act 2010 (No. 10 of 2010), and the corresponding Commonwealth Act, Volume III, pp. 3-4.

380 Taken from Schedule 2 of Victoria’s Offshore Petroleum and Greenhouse Storage Act 2010 (No. 10 of 2010), and the corresponding Commonwealth Act, Volume III, p. 23.
(b) thence easterly along the loxodrome to a point of Latitude 38º 40' 54.47" South, Longitude 148º 13' 04.59" East; and

(c) thence north-easterly along the geodesic to the point of Latitude 38º 31' 54.46" South, Longitude 148º 26' 04.57" East; and

(d) thence north-easterly along the geodesic to the point of Latitude 38º 18' 54.46" South, Longitude 148º 35' 04.55" East; and

(e) thence north-westerly along the geodesic to the point of Latitude 38º 07' 54.46" South, Longitude 148º 31' 04.55" East; and

(f) thence north-westerly along the geodesic to the point of Latitude 38º 04' 54.47" South, Longitude 148º 24' 04.55" East; and

(g) thence north-westerly along the geodesic to the intersection of the coastline of the State of Victoria at mean low water by the parallel of Latitude 37º 57' 54.48" South; and

(h) thence along the coastline of the State of Victoria at mean low water to the point of commencement.

Fig. 62. Third map in Victoria’s Offshore Petroleum and Greenhouse Gas Storage Act 2010, s. 665, p. 698; and the map in the corresponding Commonwealth Act, Volume II, p. 152, showing area to which Schedule 2 applies (within which is ‘the area to be avoided’).