100 Years of National Topographic Mapping

The First Official Topographical Map of the Commonwealth of Australia, 1912

By Brian Goodchild, Landgate
(brian.goodchild@landgate.wa.gov.au)

Abstract: In 1906 the Prime Minister, Alfred Deakin, wrote to the Premiers of each Australian state seeking their support in compiling an "official up to date map of the Commonwealth of Australia". A sum of £500 had been voted by Parliament towards the cost of compiling the map, and the states were requested to make suggestions as to the scale of the map, information to be shown and how it should be printed.

The New South Wales Lands Department was appointed to undertake the compilation of the map, and whilst the Commonwealth may have thought it was a fairly straight forward task, it could not have been aware at the time of just how difficult a task it was and how much of a problem the state of Western Australia was soon to become.

The great sticking point with the map was the projection. The New South Wales Chief Draftsman, Ernest Vautin, and the southern states, had settled on a polyconic projection at a conference in 1908 which was not attended by Western Australia. Western Australia soon voiced opposition to the projection, and led by a brilliant compiling draftsman Norman S Bartlett, strong arguments against it were soon prepared. Bartlett prepared example maps pointing out the greater distortion at the margins using the polyconic projection than would have resulted from a conic or Bonnes projection. Bartlett was able to clearly show that the polyconic projection was unsuitable, and he was backed by the WA Surveyor General, the Premier (a former surveyor) and the Commonwealth Treasurer, Sir John Forrest, also a former surveyor.

The Western Australian view did not prevail. The Commonwealth used an international expert and an international conference to support its choice, and even the Melbourne Herald ran an article on the projection, claiming it has "received the endorsement of the highest authorities". Ernest Vautin travelled to Perth to personally argue the case in March 1910, and a small file note by the Surveyor General in April 1910 sums it all up – "Mr Bartlett, I fear that the Authorities are against us". The last of the compilation material required for the map was despatched by Western Australia in May and November 1910, proof copies were supplied to the states in January 1913, and the map was finally published soon after, in 8 sheets, at a scale of 32 miles to an inch.

The First Official Topographical Map of the Commonwealth of Australia, 1912

The map proposal

On December 3 1906 the Prime Minister of Australia, Alfred Deakin, wrote to the Premiers of the Australian states advising that a decision had been made to produce an official up to date map of the Commonwealth. A sum of £500 had been voted by Parliament towards the cost of compiling the map, and the assistance of the states by "gratuitously affording available data for the purposes of the compilers" was requested. The Minister for Home Affairs was to manage the task, and assistance was also sought from the states in respect to the scale to be adopted, the information to be shown and the process to be used in the printing.

This was to be the first official map of the Commonwealth, but was the map produced and what problems were there in producing it? Seven years were to pass before the map was finally printed in 1913, most of the blame for the delays being attributable to Western Australia, and some to Queensland. WA fought passionately against the decision that the map should utilise a polyconic projection, the chief protagonist being Norman S Bartlett, Compiling Draftsman in the WA Department of Lands & Surveys. Some further brief notes on Bartlett are attached at the end of this paper.

In responding to the original request from Deakin, Joseph Hope, the Western Australian Chief Draftsman, suggested the map be at 50 miles to an inch, and he also made suggestions regarding the printing process and the type of detail that could be shown on the map. Hope was also anxious that the authorities be aware of the size of the map, suggesting a four sheet format would be necessary. The Surveyor General, Harry F Johnston agreed, added a few suggestions of his own, and the Premier, Newton J Moore (himself a former surveyor) wrote to the Prime Minister with these suggestions and offering Western Australia's support for the compilation of the map. It is presumed each of the other states did likewise, and during the next year (1907) there was frequent correspondence regarding compilation scale and other details before the details were finally decided.

In July 1908 Deakin wrote to the states with the comprehensive details of what had been decided for the map. He wrote that the projection for the map had been completed by the Department of Lands, Sydney (polyconic), and that they had been entrusted with the work. The relative sheets making up the map were supplied to each state, and a list of topographical details to be added was provided. The populations of towns was also requested, as was any astronomical positions that had been determined, and the latitude and longitude of the capital. The letter included the statement that the projection was based on a scale of 24 miles to one inch.

The Projection battle

Within two weeks Norman Bartlett, had made some calculations based on the projection and advised the Chief Draftsman that it would be extremely difficult to compile the Western Australian data. He calculated that the position of the Cape Leeuwin lighthouse would be 2 miles out of position, that he would not be able to use the Eidograph (a type of pantograph) and there was no draftsman available for such a long and complicated matter as compiling this map on this projection. He also prepared a sketch of four one degree grid squares in different extremities of the state showing how this projection distorted the area of these squares (Figure 1) and a location map for the grid squares (Figure 2).

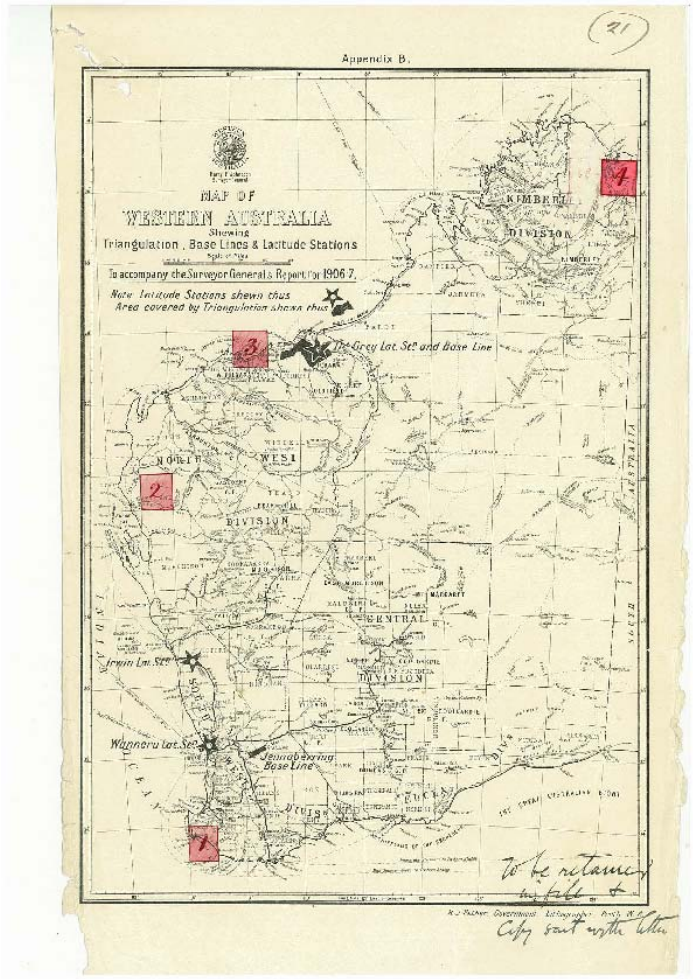


Fig 1.

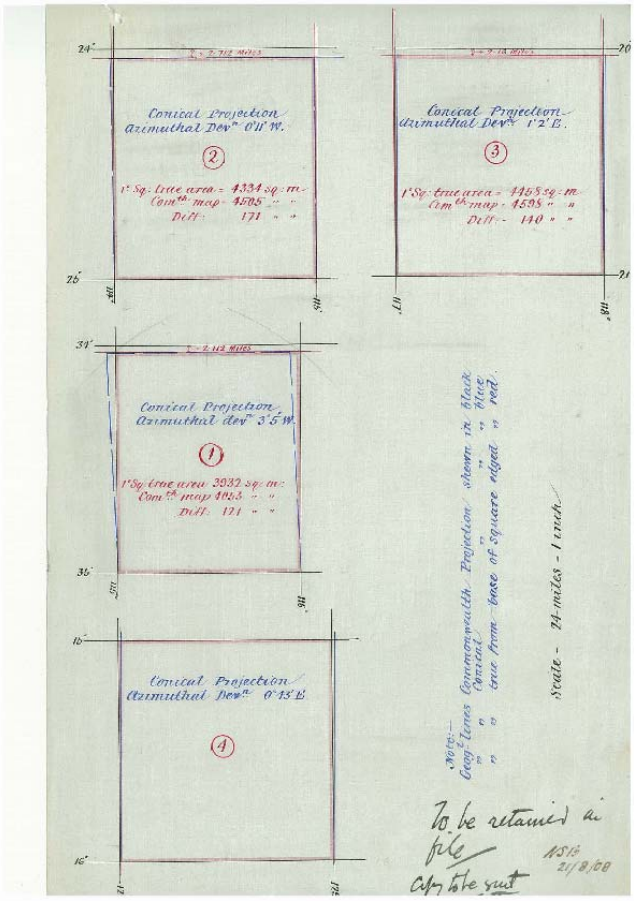


Fig 2.

Bartlett didn't pull any punches in describing the proposed projection as "most unsuitable so far as the West Australian sheets are concerned". He went further, describing it as practically useless for statistical, military or other purposes, particularly along the western seaboard between the parallels of 20 and 35 south. He also stated the plotting would be an arduous and unsatisfactory undertaking as the scale of the map is constantly changing, and he suggested a rectified conical projection should be used for the map. Bartlett's comments were forwarded to the Prime Minister by the Premier in September 1908. The Surveyor General of Queensland also wrote about the projection and raising a number of other issues about the map.

The response from the Department of Home Affairs was to first point out that neither Queensland or Western Australia attended the recent Melbourne conference where the map was discussed (WA noted it had not seen the invitation to the conference), and this was followed by a lengthy report answering the Queensland concerns and detailing the reasons for the decision to use the polyconic projection. The report was prepared by Ernest Vautin, the New South Wales Draftsman in Charge who was to oversee the production of the map.

Vautin's letter was a 10 page explanation and defence of the polyconic projection. There are probably few students of map projections around today who would debate such an issue so passionately as did Vautin and Bartlett, but Vautin hardly provided a good defence when he began by stating that the Polyconic projection had already been

adopted. His explanation was therefore about defending a decision, not necessarily choosing the best projection.

Vautin describes some illustrations in his letter to prove the weakness of the conic projection, but the illustrations were not included in his letter, much to Bartlett's frustration. His main criticism is that the conic projection sacrifices the right angles between the meridians and parallels, and this is not the case in the polyconic, and that on the whole the polyconic projection has less local distortion than the conic. Vautin further defends the polyconic by stating that it is the projection selected by the International Geographical Congress for the map sheets in the proposed 1:1,000,000 map of the world.

Bartlett is fairly brief in his response to Vautin, preferring to use an illustration to prove his point. He dismisses the reference to the 1:1,000,000 maps sheets because each sheet is a separate polyconic projection, and is only 300 miles X 400 miles, very different to the Australian map of 2,500 miles by 2,300 miles on one central meridian. The illustration he included with his response, included with this paper (Figure 3), compares the area of land distorted by the conic and polyconic projections, and which he believes proves beyond any doubt that the conic projection is superior to the polyconic for the map of Australia.

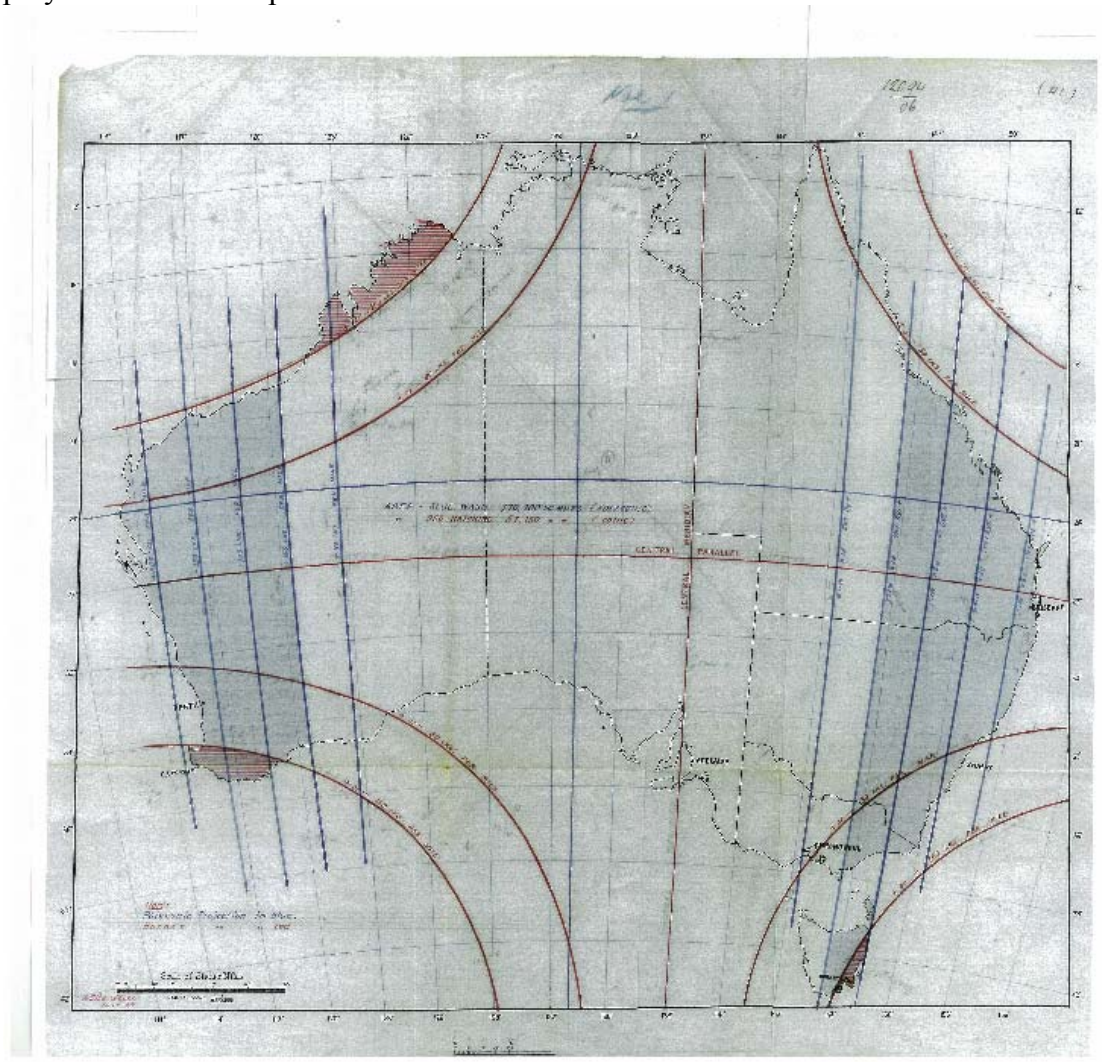


Fig 3.

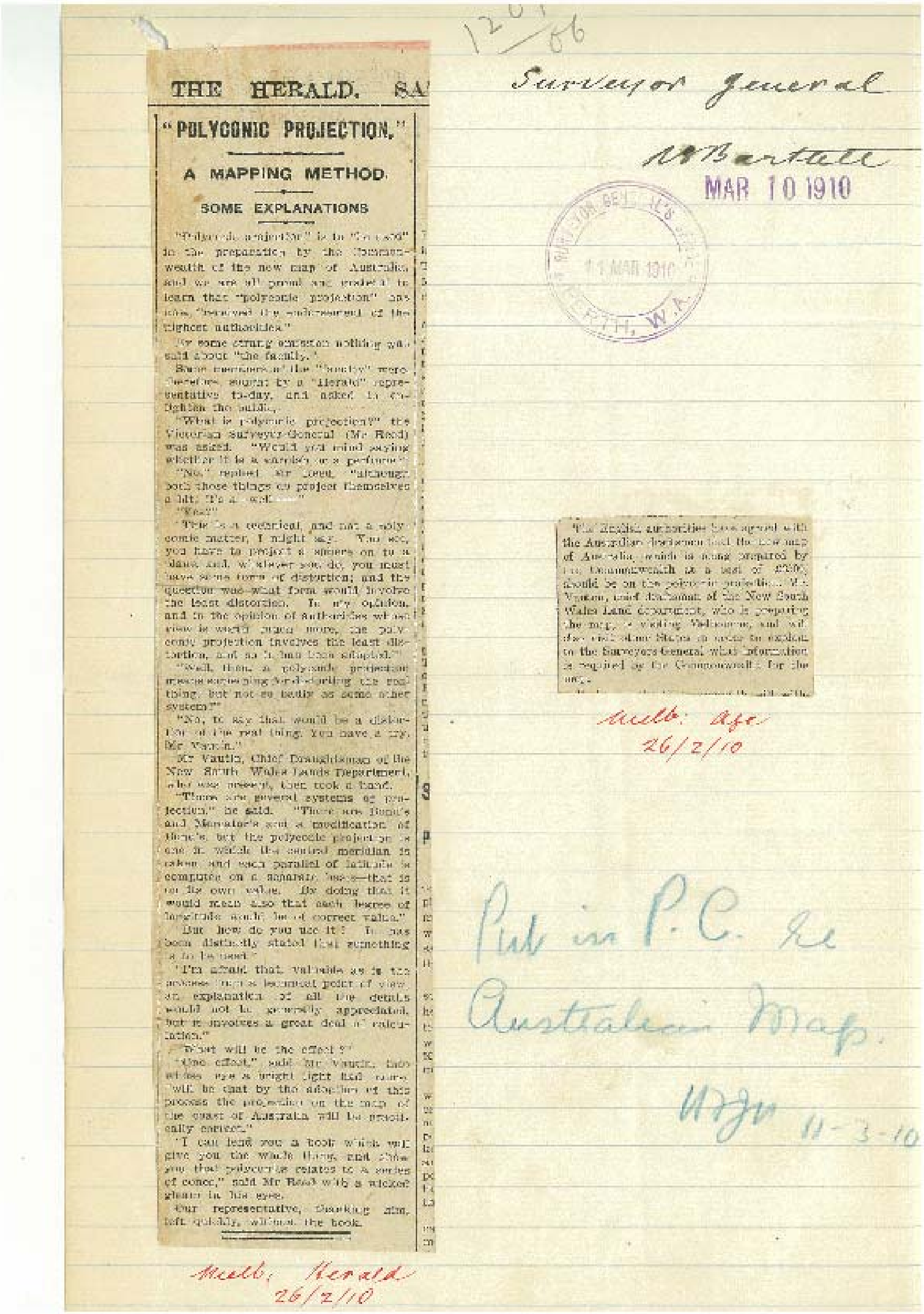
In this illustration Bartlett has taken the line of 150 links per mile as the point at which distortion becomes troublesome on a map scale of 24 miles to the inch. He calculated the maximum possible errors for the polyconic projection to be 350 links per mile, and for conic to be 185 links per mile. He then also calculated the areas outside the 150 links per mile limit, and for the polyconic it is 770,400 square miles, and for conic it is 57,150 square miles.

Not surprisingly, the Surveyor General and the WA government continued to back Bartlett, but to no avail. The Premier at that time (1909), Newton Moore, was himself a distinguished surveyor who went on to hold a seat in the House of Commons, and he wrote to Prime Minister Andrew Fisher strongly urging reconsideration of the projection. A new Prime Minister, Alfred Deakin (again) decided (perhaps in frustration) to refer the matter to an international Geodetic Conference to be held in London in September 1909.

About this time it was reported in "The West Australian" that progress on compiling the map was slow, and that none of the original £500 had been spent. Even a £1,000 allocation in the current budget had not been spent, but Mr Knibbs, the Federal Statistician who was supervising the map confirmed the tentative decision that the map would be on the polyconic projection!. Another report, in "the Advertiser" in July 1909 reported that the compilation of the map was designated to four distinguished surveyors, Reid (Vic), McDonald (NSW), Spowers (Qld) and Johnson (SA), but this is the only reference to this group in any of the papers I have seen about the map. The article refers to them discussing their scientific troubles regarding the map projection with the Minister for Home Affairs!

Cecil Darley was appointed the Australian representative to the geodetic conference, but as it appears the main purpose of the conference was standardizing the 1:1,000,000 scale International Map of the World, it would hardly benefit the WA point of view. Supporting material was supplied to Darley, but it was obvious further argument would be futile. In January 1910 Deakin wrote to the Western Australia Premier with the telling statement "I have the honour to inform you that after the most careful consideration, and with the advice of the highest authority on the subject, it has been decided to adhere to the Polyconic Projection in the compilation".

Was it time to throw in the towel? Bartlett and Johnston decided they wouldn't capitulate just yet, and they enlisted a heavyweight to support the cause. John Forrest was a prominent member of the federal parliament, former Premier of WA and also Surveyor General. He was an imposing figure in the Parliament, and after Johnston discussed the projection with him he agreed to write to the Prime Minister stating his opposition to the polyconic projection. He telegrammed his position to Deakin on 22 February 1910, but by this time the Commonwealth had just about lost patience with WA, and Vautin was despatched to visit each state and explain personally the requirements for the map and steps required to avoid any more delay. The newspapers were also utilised to strengthen the case, and the Melbourne Age ran a story on 26 February explaining the proposed mapping methods and the reasons for the polyconic projection (Figure 4). Deakin's reply to Forrest also strongly supported the chosen projection.



Surveyor General

W. B. Bartlett

MAR 10 1910

11 MAR 1910

PERTH, W.A.

THE HERALD. SA

"POLYCONIC PROJECTION."

A MAPPING METHOD.

SOME EXPLANATIONS

"Polyconic projection" is to "be used" in the preparation by the Commonwealth of the new map of Australia, and we are all proud and grateful to learn that "polyconic projection" has [illegible] "received the endorsement of the highest authorities."

By some strange omission nothing was said about "the family."

Some members of the "family" were therefore sought by a "Herald" representative to-day, and asked to enlighten the public.

"What is polyconic projection?" the Victorian Surveyor-General (Mr Reed) was asked. "Would you mind saying whether it is a [illegible] or a perfume?"

"No," replied Mr Reed, "although both those things do project themselves a bit. It's a [illegible]."

"[illegible]"

"This is a technical, and not a polyconic matter, I might say. You see, you have to project a sphere on to a plane, and, whatever you do, you must have some form of distortion; and the question was—what form would involve the least distortion. In my opinion, and in the opinion of authorities whose view is worth much more, the polyconic projection involves the least distortion, and so it has been adopted."

"Well, then, a polyconic projection means something [illegible] the real thing, but not so badly as some other system?"

"No, to say that would be a distortion of the real thing. You have a try, Mr Vautin."

Mr Vautin, Chief Draughtsman of the New South Wales Lands Department, who was present, then took a hand.

"There are several systems of projection," he said. "There are [illegible] and Mercator's and a modification of [illegible], but the polyconic projection is one in which the central meridian is taken and each parallel of latitude is computed on a separate basis—that is on its own value. By doing that it would mean also that each degree of longitude would be of correct value."

"But how do you use it? It has been distinctly stated that something is to be used."

"I'm afraid that, valuable as is the process from a technical point of view, an explanation of all the details would not be generally appreciated. But it involves a great deal of calculation."

"What will be the effect?"

"One effect," said Mr Vautin, [illegible] "will be that by the adoption of this process the projection on the map of the coast of Australia will be practically correct."

"I can lend you a book which will give you the whole thing, and show you that polyconic relates to a series of cones," said Mr Reed with a wicked gleam in his eye.

Our representative, thanking him, left quickly, without the book.

Melb. Herald 26/2/10

The English authorities have agreed with the Australian [illegible] that the new map of Australia, which is being prepared by the Commonwealth at a cost of £[illegible], should be on the polyconic projection. Mr Vautin, chief draftsman of the New South Wales Land department, who is preparing the map, is visiting Melbourne, and will also visit other States in order to explain to the Surveyors General what information is required by the Commonwealth for the map.

Melb. Age 26/2/10

Put in P.C. re Australian Map.

[illegible] 11-3-10

Fig 4.

On the 1st of April 1910 Surveyor General Johnston wrote a terse note to Bartlett "I fear that the authorities are against us", and with that they threw in the towel and cooperated with supplying the information the Commonwealth required. During the remainder of 1910 and in early 1911 correspondence from NSW Lands detailed further information required, and WA responded appropriately. In July 1912 a request was received from the Commonwealth seeking information on the boundaries of artesian basins, so it seems there were to be different versions of the map made available.

The published map

In January 1913 the first proof copies of the map were received from the NSW Lands Department. The map was on a natural scale of 1: 2,027,520, or 1 inch to 32 miles. It comprised 8 sheets, numbered 1. 2. 3. 4.
5. 6. 7. 8.
Two unrevised copies of the relevant portion of the map were sent to each state, the WA sheets being 1, 2, 5 and 6, with one copy to be revised in red ink and returned as soon as possible. The Western Australian maps were revised and returned in a little over two weeks. The story of the map finishes at this point, but there is another twist in the story. I have been unable to locate a full copy of the 8 sheet map anywhere in the Commonwealth records. Western Australia has a copy of the four westernmost sheets, but the National Library and the National Archives only appear to have later versions of the map, not the original 8 sheet map. Examples of portions of the finished map are attached (Figure 5, Figure 6) The map was to prove the basis for other editions at different scales, particularly those published in the Commonwealth Year Book, and there are copies of these versions available, but not apparently, the first edition. Corrections and updates were made to the map in 1916/17 and also in 1920.

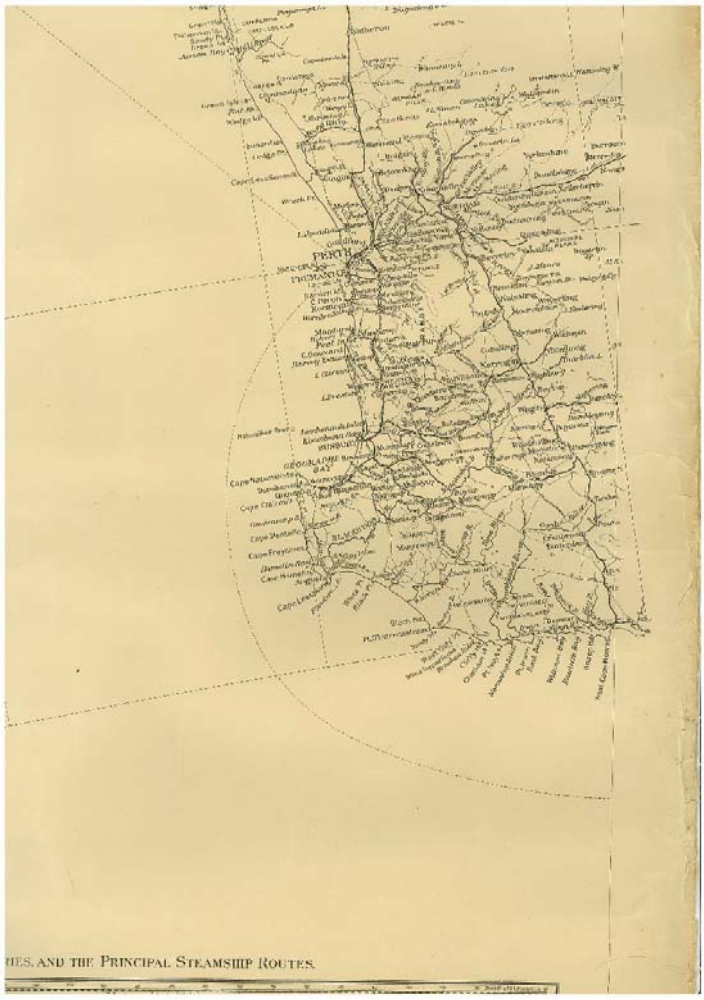


FIG 5.

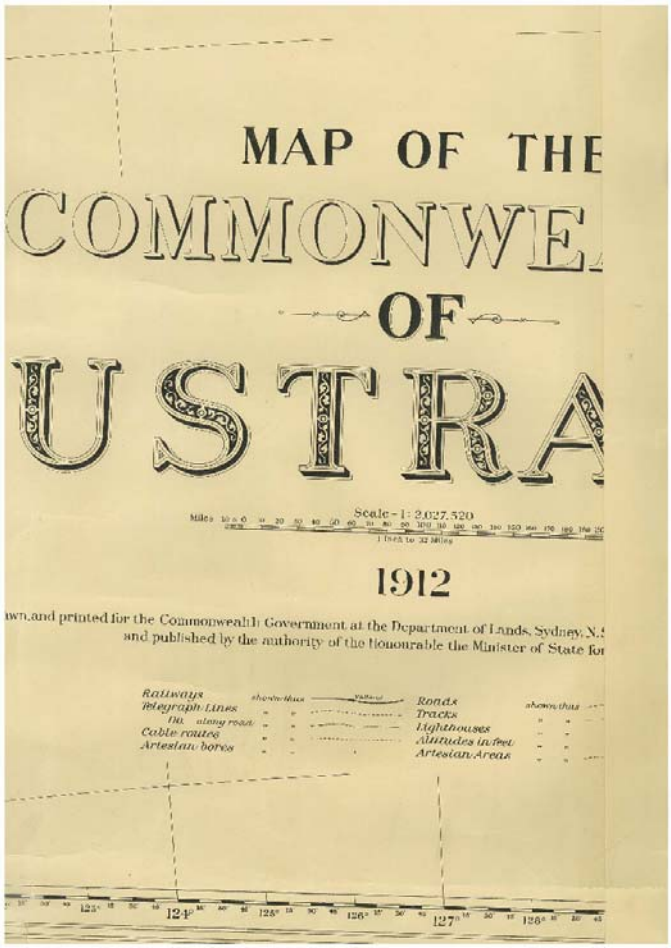


FIG 6.

There is a touch of irony when amendments were being made in 1920 in that Norman Bartlett was now the Chief Draftsman, and he describes how much difficulty he is having plotting new work on the map "on account of the unsuitable projection that has been adopted in its construction". He pointed out the many distortions present on the map and concluded with "now that the map is published there is no doubt that the defects feared have not in any way been eliminated". Sadly however, his main opposition had been eliminated, as Vautin took his own life in 1916.

The Southern Ocean mystery

There is another twist in the tale of the map following its publication in 1913. The published map is the first map to show the name "Southern Ocean" for the sea washing the southern shores of the continent. Where did the name come from and who decided it should be shown? In Western Australia the name was first used on the letters patent describing the state in 1890, but it was not shown on maps. The Government Statistician in Western Australia drew attention to the name on the 1913 map, and as he could find no reliable reference to it research was conducted into the name. The research established some precedence for the name in Western Australia, but with no authority. When this was reported to the Premier he decided to approve the name (although he preferred Great Southern Ocean), and supported writing to the Federal Government and the Admiralty recommending adoption of the name.

The Prime Minister (Joseph Cook) supported action being taken to determine the name of the ocean washing the southern shores of Australia, and he requested the Governor General to contact the Admiralty for their opinion on the matter. The Admiralty's response was to outline the history of the naming of the oceans around Australia, but it also suggested that proper consideration could be given to applying the name Southern Ocean to the ocean bordered on the north by a line joining the southern portions of South America, South Africa, Australia and New Zealand, and bounded on the south by the Antarctic continent. On the 26th of September Prime Minister Andrew Fisher wrote to the Western Australia Premier informing him that the name Southern Ocean had been adopted for the sea area south of the Australian continent.

In Western Australia the Education Department was promptly advised of this approval, with a request to correct school atlases, and the name was quickly adopted in the state. In May 1915 advice was received from the Governments of New Zealand and South Africa concurring with the adoption of the name Southern Ocean for the area earlier described.

A gazetteer for the map

In 1921 there was another item of interest arising from the map. Commonwealth Staff Surveyor F M Johnston, a son of Surveyor General Johnston, wrote seeking support for the compilation of a gazetteer "as an adjunct to the Index of this map". A list of about 3,000 names was to form the basis of the WA portion of the gazetteer, and the cost of compiling such a record, which would include historical information on the origin of names was estimated by the former Chief Draftsman to be about £25. A further request with more details on what was proposed was received from the Commonwealth's Chief Draftsman, Mr F J Bromowski, in October 1921.

At first it was felt that no money was available for the project, but a year later the £25 expenditure was approved by the Minister for Lands. Bromowski was advised, and he provided a sample page (Figure 7) of what was required on the names. Joseph Hope, the retired Chief Draftsman compiled the gazetteer over the next 15 months, and "Hopes Gazetteer" became the basis of the first geographical names gazetteer for Western Australia for about the next 60 years. It was provided to the Commonwealth in December 1924, and the response indicated good progress had been made on the national gazetteer, and they hoped to be in a position to publish before very long. It is not known if the list was published.

LUDAJ. C. P2. W.	A densely wooded point, not easily distinguished from the sea. No white population.
MADANG TN. M2. N.W.	A small township on Madang or Friedrich Wilhelm's Harbour, three stores conducted by Europeans, several Chinese stores, Hotel, European Hospital, Medical Officer, Government Station established, also wireless station, situated on a particularly good harbour, Madang is now a port of call for steamers trading with Australia, Occupied by Australian troops in 1914.
MAREHAM. R. M2. C.	A considerable mountain stream, current rapid, depth shallow, and constantly changing, mouth about 450 yards wide, and at times closed by a bar. This river is also known by the native name of WUSSI.
MARQUEEN IS. R1. S.W.	Situated 115 miles N.E. of Kieta, a series of small coral islands, and reefs, surrounding a lagoon about 6 miles by 7 miles. A great many coconut trees which have been acquired, and the islands now conducted as a plantation.
MERITS ID. O1. S.	A fairly large island of the Witu or French Island group. In area about 7000 acres. Surrounded by a coastal reef. Anchorages on the North and South coasts. A plantation of about 1250 acres established thereon.
MERKUS. C. O2. C.	A bold precipitous point fringed by a reef. At entrance to Arawe Harbour. A plantation established on actual Cape.
MOILA PT. Q2. C.	A prominent cape forming the extreme southerly point of Bougainville Island. No white population.
MONTAGU. HAR. O2. E.	Named by Dampier in 1700, after Charles Montagu Earl of Halifax. Provides an anchorage during the North West Monsoons.
MOROBE TN. M2. S.E.	Site of Government Station on Adolf Harbour. Wireless Station established. See Adolf Harbour.
MORTLOCK ID. R1. S.W.	See Marqueen Is.
NEW BRITAIN ID. O2. E.	The largest island of the Archipelago, named by Dampier in 1700, name afterwards changed by German Government to Neu Pommern, but again known as New Britain, after occupation of Australian troops. Numerous plantations. Government Stations at Rabaul, Talasea, & Gasmatta.
NEW IRELAND ID. P1. S.	A long narrow island second largest in Archipelago. Named New Ireland by Carteret in about 1767, altered by German Government to Neu Mecklenberg, now again known as New Ireland. Numerous plantations North, East, and West, coasts. Government Stations at Kaewieng. and Namatanai.

Fig 7.

References

Lands & Surveys Department File 12094-1906
"The West Australian", Perth, 12/10/1909.
"The Advertiser", Adelaide, 8/07/1909

Norman Statham Bartlett was somewhat of a legend at the Department of Lands & Surveys. For many years he had the simple title of Compiling Draftsman, but he had more influence over mapping, geodetic and surveying decisions than any one else of his day. These experiences culminated in the publication of the ***"Handbook for surveyors and draftsmen'' by N S Bartlett*** in 1911. This handbook of 110 pages sets out in detail observing and computation procedures for astronomical observations and

triangulation, base line measurement, standard plan sheet line computations and drafting office procedures. It was used by staff up until the 1950's. He was born in England in 1864, migrated to NZ in 1881 where he graduated from Dunedin University as a surveyor and later moved on to Victoria where was employed by the Railways Department This led him to join a civil engineering firm which was involved with the design and survey of irrigation works at Shepparton in Victoria. In 1895 he got swept up in the gold rush to WA and came to Perth joining the Lands Department as a draftsman in the compiling Branch in 1896. Following the departure of J. Hope in1916 he became Chief Draftsman.

Ernest Stafford Vautin was born in Adelaide in 1856 and joined the NSW Lands Department in 1876 as a temporary draftsman. He rose to the position of chief draftsman in charge of one of the compiling branches, and was an expert in map production. He also took an active interest in military matters, and for several years was Captain of the Lands Department Rifle Club. He was a keen public servant, and was President of the NSW Public Service Association 1902-03. Vautin was a very skilled and highly regarded cartographer, and also a keen photographer. He took his own life in 1916 following a period of illness.