Quidong Mineral Field, NSW: An intriguing discovery of W.B. Clarke

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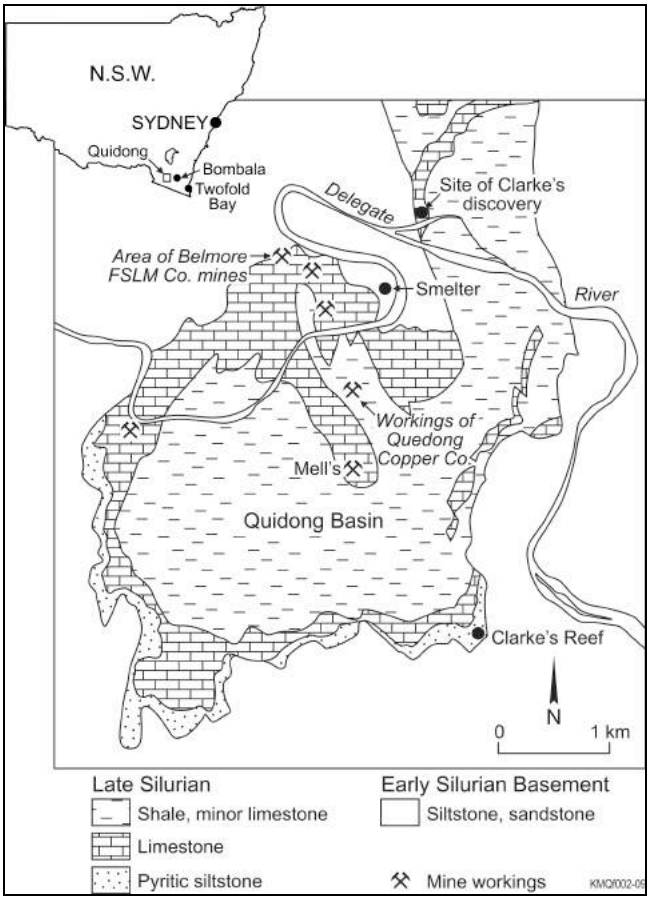
During his exploration of the southern goldfields from late 1851 to early 1852, the Reverend W.B. Clarke, widely considered the father of Australian geology, made a discovery of copper at Quidong in the Bombala area of southern New South Wales (Figure 1). Clarke was mainly interested in finding new occurrences of gold and at a site on the edge of the Delegate River he panned 'colours' of the yellow metal from detritus trapped within cavities in some limestone outcrops. He also observed that nearby there were outcropping veins of copper carbonates with a little lead sulphide, and he predicted that a major mineral field would develop in the vicinity. Thirteen years later the first unsuccessful attempt was made to mine the copper. Veins of lead-silver ore were discovered during the initial mining, prompting later attempts to mine and smelt this ore on site. This venture also failed, but the area continued to fascinate and attract miners and promoters. Since the 1950's numerous mineral exploration companies have examined and tested the Quidong Basin using the full array of modern exploration techniques. The site is remarkable for the way in which, for more than 150 years, it has tantalised prospectors and geologists with its interesting geology and intriguing signs of copper, lead, silver and gold mineralisation. This is despite the fact that no significant ore deposits have yet been found.

Clarke's Discovery

In August 1851, following the initial gold rushes sparked by the promotional activities of Edward Hargraves, the New South Wales Government sponsored the Reverend William Clarke to conduct a survey of the colony's goldfields.[1] At this time Clarke was a highly regarded geologist having made many important geological observations and discoveries since arriving in the colony in May 1839. He had also found gold near the head of the Cox's River west of Hartley in the Blue Mountains in February 1841.[2] After some discussion with Governor Fitzroy, Clarke commenced his survey in September 1851 by proceeding southwest to the recently discovered Braidwood-Araluen goldfields. He then worked his way further south to the area of the Monaro and

Southern Alps. During this survey Clarke: panned for gold; looked for signs of other mineralisation; examined and described numerous geological features; collected information and samples from the locals; and used a barometer to make measurements of the land elevation. He had a theory that the best alluvial goldfields would be found at particular elevations in eroded mountain chains. Too high and the gold would not yet have been released from the rocks, too low and it would all have been eroded away or reburied. Clarke also believed that gold and other metalliferous deposits would be found along particular lines of meridian, an idea that initially seemed to hold up in the north-south trending geological units of eastern Australia.[3]

Figure 1: *Location of the Quidong Mineral Field and simplified geological map showing position of some historic sites.*



Source: Adapted from K.G. McQueen, 'Sediment geochemistry and base metal sulphide mineralisation in the Quidong area, southern New South Wales, Australia'. *Mineralium Deposita*, vol. 24, 1989, pp. 100-110.

In early February 1852, Clarke was camped at Brogalong Creek (Figure 2), a tributary of the Delegate River west of Bombala, examining the geology and gold prospects of the tract between the McLaughlin and Bombala rivers.[4] The previous

month he had been given a sample of gold from this area, noting in his report of 3rd January that 'a specimen of gold dust from near Quedong has been placed in my hands today'.[5] Clarke was able to obtain fine gold at the same location by panning the detritus trapped in hollows in the weathered limestone near the junction of the Delegate River and Slaughterhouse Creek (Figures 1 and 2). However, his attention was drawn by brightly coloured copper carbonates in the same limestone. He collected fossils from the limestone and adjacent shales, which allowed him to correctly conclude that these rocks were of Silurian age. He made a very favourable description of the area as follows:

> As the extent of the limestone country is considerable, and its aspect such as to lend to the belief that it is metalliferous, being bare of grass, and extremely ferruginous in hue, occasioned by the presence of cupriferous limestone, I think it not improbable, that much more than an insignificant quantity of gold may be discovered hereafter … Exactly where the largest auriferous hollow occurs, veins of copper and lead several feet in width make their appearance in the limestone, and pass through to the face of the cliff in a S.E. direction. The vein stuff is chiefly barytes and the ores are chiefly fibrous and earthy green carbonates and yellow and iridescent sulphurets of copper, with interspersed crystallized sulphuret of lead. As copper and lead exist in various parts of this tract of country, it is extremely probable that a mining field may be here profitably worked. At present, I am only able to report upon the existence of these ores, of which, I forward samples by the Bombala Mail of the 7th instant.[6]

Clarke's samples later appeared in the Paris Exhibition of 1855 as copper and lead ores in limestone from 'Merinoo, Deleget River'.[7] It is likely that local landholders had already noticed the bright green and blue signs of the copper ore, but Clarke appears to have been the first to positively identify these and suggest that they could be profitably mined.

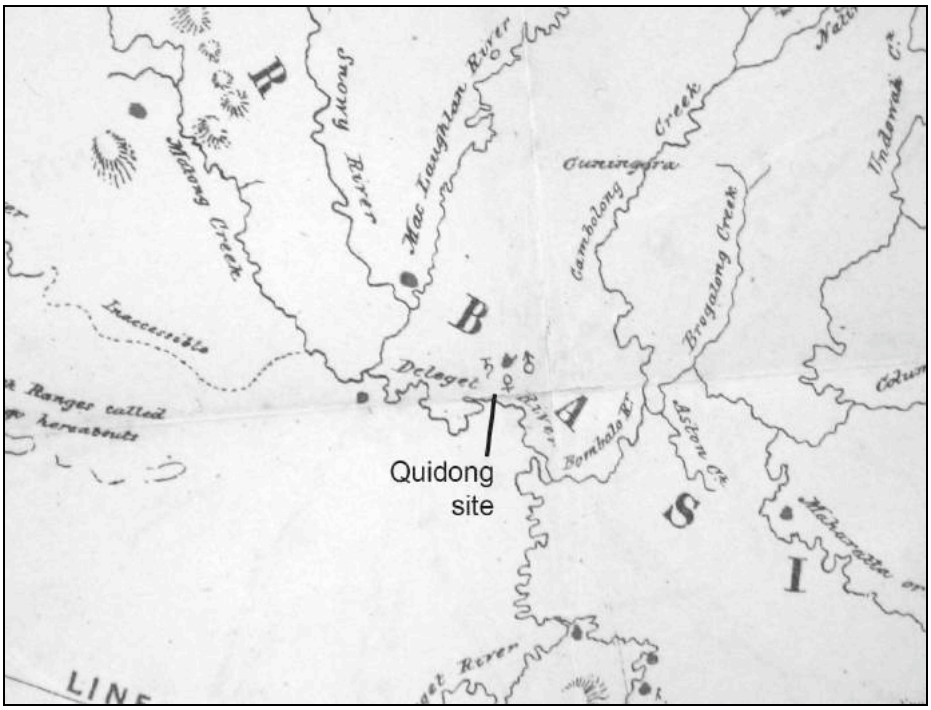
Further prospecting and first attempts at mining

Clarke's observations were forwarded as reports to the colonial government and also partly published in edited form in the *Sydney Morning Herald*.[8] Later he collated and slightly expanded the reports in his book, *Researches in the Southern Gold Fields*', published in 1860. By this time local people were fully aware of the Quidong occurrences and some had collected specimens of the copper ore.

In March 1864 Norman Taylor, a field geologist with the Geological Survey of Victoria, arrived on the steamer *Alexandra* in Twofold Bay with a small party, including Jacob Braché as topographical surveyor. This party had been charged with exploring the country of east Gippsland between the Snowy River and the boundary separating the

colonies of Victoria and New South Wales. More particularly they were to examine the Genoa River area where there had been reports of a gold discovery.[9] Jacob Braché was a Prussian mining engineer who had come to Australia in 1853 after working for five years in the gold and silver mines of South and North America. He was attracted to the Victorian goldfields where he was one of the first to advocate larger scale company mining, particularly of the gold reefs. In 1861, after a number of failed mining ventures, he had joined the Geological Survey of Victoria as a mining and topographical surveyor.[10]

Figure 2: *Extract from map prepared by W.B. Clarke, showing the location of gold, iron, copper and lead mineralisation found by him in February 1852. Large dots show the sites where Clarke detected gold.*



Source: Map of gold localities in the basins of the Snowy River, W.B. Clarke, 1860.

During the Taylor expedition, trips were made across the border to Bombala, mainly to obtain supplies, medical help and repairs to compasses. On one of these trips in April 1864 Braché was shown specimens of copper ore from Quidong in one of the huts or shanties that he visited.[11] He inspected the site and was sufficiently impressed to negotiate a mining lease with Captain Ronald Campbell, the freehold owner of Bombalo station. In July, apparently without permission and to the surprise of Taylor, Braché travelled to Sydney to secure a further area on Crown land outside the area he had leased. He then returned to Melbourne and after discussion with one or two Melbourne

merchants formed a company of 21 shareholders titled the Adventure Company.[12] In September, Braché was dismissed from the Geological Survey (although he claimed to have resigned), possibly as a result of his 'extracurricular' activities.[13] Taylor continued the survey and in December visited the Quidong area with William Allen, who was by then manager at the site. He collected fossils from the limestone for comparison with those in Victoria. In January 1865 Alfred Selwyn, Director of the Geological Survey of Victoria, visited the expedition and also inspected Quidong.[14] At this time there was growing interest in base metal mining in southeastern Australia. Hitherto the focus had been on gold, although small deposits of copper, lead, silver and iron had been discovered and mined on a limited scale.[15] Copper deposits were known at Copper Hill and Cadia in central New South Wales and copper was being mined at Currawang, south of Collector in the southern districts.[16] Across the border in Gippsland, the Cooper's Creek copper mine was being actively developed.[17] In South Australia rich copper deposits had recently been found at Wallaroo and Moonta to add to the producing mines at Kapunda and Burra Burra. The major base metal and silver deposits of Cobar, Captains Flat, Broken Hill, and Mt Lyell were still unknown.[18]

Figure 3: *View of portion of the Quidong Basin looking southeast across the Delegate River. A number of faults with gossanous outcrops can be seen (dark areas) as well as the area prospected by the Quedong Copper Mining Company Ltd (top far right).*

Source: Photo taken by author in 1980.

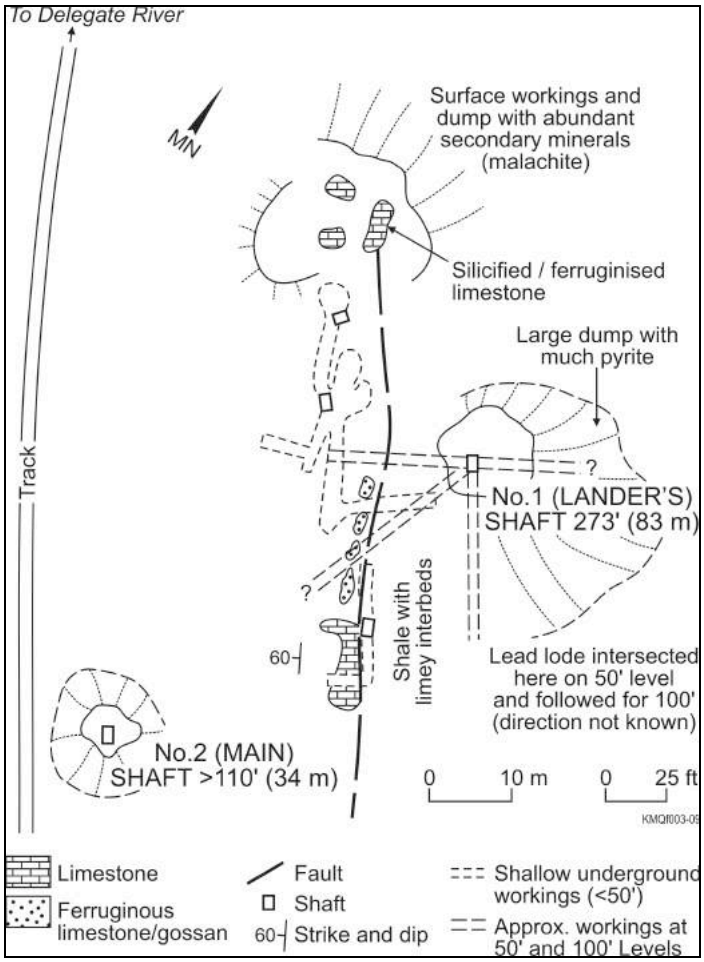
On the 2nd February 1865 members of Braché's Adventure Company floated the Quedong Copper Mining Company Ltd with nominal capital of £24,000 in 24,000 shares. The company was incorporated in Melbourne on the 22nd of July with subscribed capital of £2,985 17s 6d. Members of the Adventure Company were allotted 1,000 shares each, paid to 2s 6d. Three thousand additional shares were allotted *pro rata* to the original 'adventurers' but had to be paid to £2 2s 6d (i.e. a £2 premium). Most of these shares were taken up, raising £5,774. Charles M. Inglis who 'made the discovery known to the body of the adventurers' (in other words the promoter) was paid a bonus of £2,000 and Jacob Braché received £500 for his services, including negotiating the lease with Captain Campbell. There was also a provision for Braché to receive an additional £1,000 out of the first net profits of the mine. The new company held 180 acres of ground over the main outcrops of copper ore, with the further right to another 120 acres. The terms of the lease provided for a 10 percent royalty on net profits, an annual rental of £160 and a term of 21 years.[19]

Mining commenced in early 1865 at an outcrop of copper ore on the south side of the Delegate River (Figures 1 and 3). Veins of secondary copper carbonates and oxide from six-inches up to bunches several feet across were exposed in shallow shafts and pits. Captain William Tonkin, described as a man of great experience in copper and lead mining both in England and South Australia, was employed to develop the mine. Small samples of ore were sent to several Melbourne assayers and returned 6 to 82 percent, but mostly around 30 percent copper. In May, a parcel of 17.7 tons of unpicked ore was transported to Eden and shipped to Melbourne on the steamer *Barwon* before being sent on to the English and Australian Copper Company in Adelaide. Average assays for this ore were around 11 percent copper and the sample was purchased for smelting at £79. 3s. 8d.[20] The total cost of transporting the ore to Adelaide was £124. 12s. The English and Australian Copper Company offered to buy more ore at the mine, or on delivery in Adelaide, but clearly the only profitable option would be to smelt the ore on site. There was great local optimism that the district would become an important mining and smelting centre. The editor of the *Southern Telegraph* in Bombala even talked of the Quedong mines knocking the famous Burra Burra copper mine 'into a cocked hat'[21] During this period there was an attempt to renegotiate the terms of the original mining lease. The chairman of the company, Joseph Thomson and another shareholder visited Captain Campbell with a proposal, but due to 'unauthorised

interference on the part of two of the shareholders' this was not successful and the lease was prepared and presented for execution as originally agreed between Braché and Captain Campbell.[22]

By June, a shaft (No. 1 or Lander's Shaft) had been sunk to 100 feet with drives at the 50 and 100 feet levels extending 165 and 85 feet respectively.[23] At about 70 feet southeast of the shaft on the upper level a lode of lead carbonate averaging three feet wide was struck and followed for about 100 feet. The lower level was developed in the same direction but did not intersect the lode, which appeared to be striking east-west and dipping north, that is cross-cutting the near surface copper veins. No sign of significant copper ore had been found in the deeper workings. A drive was then commenced in a northeasterly direction to explore for the copper (Figure 4).[24]

Figure 4: *Plan of the Quedong Copper Mining Company Ltd workings developed between 1865 and 1868. These are amongst some of the oldest base metal workings in N.S.W.*



Source: Sketch map constructed by the author in 1981, shallow underground workings from A.M. Martin (Delta Gold N.L., 1989), deeper workings estimated from descriptions in historic reports and partly confirmed by drilling.

The first general meeting of the Quedong Copper Mining Company was held in Melbourne on the 7th of August 1865. The Resident Manager, William Allen reported that a new shaft had been started about 200 feet south of the No. 1 shaft to test the ground at greater depth. This shaft was being closely timbered so that it could be used as an engine shaft if required. At this stage both shafts were being worked by simple horse whips. Several hundred tons of copper ore were at grass from the near surface workings as well as 100 tons of lead ore extracted from the No. 1 Shaft. A total of 25 men were employed, and with the two horses on the whips and a bullock team to cart timber to the mine the operating cost was about £100 per week. Due to the remote location the miners were being supplied with rations additional to their wages, but it was hoped to convert the operation to a tribute or contract system in the near future. A wooden bridge (Allen's Bridge) had been constructed across the Delegate River, south of Quidong to allow all weather access to the mine via a good bush track from the town of Bombala. Total expenditure for the 6.5 months of operation had been £2,058 11s 10d.[25] At the meeting Joseph Thomson, Richard Sheppard Danson, Isaac Younghusband, William Macredie, William Allen and Charles Heape were unanimously elected directors and awarded £75 for their services during the previous six months. The resident director was to receive £10 per week, while J.K. Bickerton had already been appointed secretary of the company.[26]

Over the next several months the underground workings were extended in a vain attempt to locate a payable copper lode. A winze between the two levels south of Landers Shaft intersected some stains of green copper carbonate and areas of 'mundic' (pyrite or iron sulphide). The cross-cut north east of the shaft also encountered 'mundic' and quartz but no significant copper ore. The miners were then redirected to drive south west at the same level with the aim of intersecting a vein of copper ore that had been opened up on the surface.[27] At the next general meeting of the Company on the 2nd February 1866 the directors made the first call on shares to raise funds for the ongoing prospecting activity.[28]

The lack of success at the mine generated concern amongst some of the shareholders and subsequently the directors engaged Captain Thomas Polshue to inspect and report on the property. Following his recommendations, an extraordinary general meeting held on the 20th of June agreed that Lander's shaft be deepened by 50 feet or more by following the 'vein of mundic', in the belief that 'at a greater or less depth ores

of copper will be discovered'.[29] It was also agreed that the shaft be timbered to this depth and a horse whim erected to cope with the expected inflow of water. Also at this meeting the company secretary, J. Bickerton, tendered his resignation but the directors, with one exception, strongly recommended its withdrawal. A requisition to the board of directors signed by 62 dissatisfied shareholders representing 13,000 shares seeking the replacement of Bickerton by R. Schlesinger as secretary having been rejected, on the 16th of July a special meeting at the Duke of Rothsay Hotel in Melbourne called on the directors to appoint a new secretary and change some other aspects of the company's operation. This meeting orchestrated by Richard Danson, one of the directors, and chaired by Captain B.R. Mathews, also discussed mismanagement of company funds, passed a motion of no confidence in the directors and called for the election of a new board. It was also resolved that there should be no fees paid to directors except out of profits and that the deed of association should be altered so that directors would be elected every half-year.[30] The ire of these shareholders must have been exacerbated when revealed at the next annual general meeting on 1st of August 1866 that Bickerton had been reappointed as secretary with a 100 percent salary increase.

At this meeting, the directors reported they had engaged a party of experienced miners who would travel to Quidong later in the month to commence deepening Lander's shaft according to the recommendations of Captain Polshue. James Reid of Maldon had been appointed to supervise the work at a salary of £5 per week and was to receive a bonus of £50 if he discovered a payable lode. Jacob Braché queried the hurried plan to develop the mine in this way and also questioned whether James Reid had any experience in copper mining. From the Chair, William Macredie replied that before being appointed, Reid had assured the directors 'that he had been brought up to copper-mining from his youth'. Braché also argued that the offer of a bonus was 'absurd' as it was known that there was a lode in the mine. Another shareholder, a Mr Skarratt, asked if there was not some surface ore that had led to the formation of the company, to which the chairman replied that there were surface indications, but what was at first supposed to be a lode 'had disappeared upon an attempt being made to follow it'. An extraordinary meeting after the main meeting altered the articles of association to provide for the retirement of directors after each ordinary general meeting every six months.[31]

Over the next six months the company followed the recommendations of Captain Polshue, deepening Lander's shaft a further 107 feet to a total depth of 254 feet.

Expenditure for the period was £12,150, including £2,500 paid in bonuses and £881 13s 3d in connection with sinking the shaft. At the general half yearly meeting in February 1867, the board of management reported that the indications were good, but payable copper had still not been found. A specimen collected from the mine and analysed by the Geological Survey was described as pyrite in a dark impure limestone, reportedly with 19.5 percent copper. The mine manager, James Reid, was anxious to commence a drive before the shaft got much deeper as he expected the inflow of water would soon dramatically increase. He also felt that it was necessary to explore by driving if there was to be any chance of finding a copper lode.[32] Work appears to have continued through the early part of 1867 until another extraordinary meeting of the company was held in June to consider a recommendation on further development. The mine manager reported that in order to prospect at greater depth it would be necessary to sink another deep shaft about 400 feet south of Lander's and erect pumping machinery. The cost was estimated at £5,650. It was reported that Mr Reid spoke 'in hopeful terms of the prospects of the mine' and when questioned by a shareholder he produced a sample collected from the bottom of Lander's shaft, which he said 'he looked upon as an unfailing symptom of the presence of a payable copper lode close at hand'.[33] The width of the lode (actually pyrite-rich material) was twelve feet and increasing. He believed that the cost of sinking a new main shaft to 300 feet would be about the same as extending the existing shaft another 50 feet as the new ground was much more favourable. It was also stated that:

> so confident were the men employed at the mine of the goodness of the ground that they were willing to work at 40s per week instead of 70s, provided they got 50s a week more out of the proceeds of the ore.

The meeting then resolved to carry out the new works with the proviso that shareholders should have the option of relinquishing their shares *in lieu* of payment of further calls.

Towards the end of 1867 all work at the mine was suspended, while the company sought additional capital. Most of the existing shareholders seemed reluctant to put more money into the venture and some had already forfeited their shares for not paying calls and it was decided to seek funds from overseas by placing 12,000 shares on the London market.[34] A collection of samples was sent to a Mr Westgarth in London, an agent of the company charged with attracting British investors. He reported that although the money market was particularly buoyant in some respects and that a large

amount of capital was available for established investments, investors were reluctant to support new ventures, especially those of a more speculative character.

It became apparent that the required capital could not be raised in London and in August 1868 they recommended the company be wound up but Jacob Braché indicated that he would be willing to 'resuscitate the company as soon as his present engagement would permit'.[35] By February 1869 it was clear that the company could not be recapitalised in its present form and Braché, who was now a director, proposed a total reorganisation by amalgamating with the New Adventure Company, which held adjacent claims. He still believed that the mine would prove profitable and that once the company was reorganised it could be refloated on the English market.[36] This reorganisation did not go ahead and the company was eventually wound up after expending a total of £13,600. The proposed new main shaft was not completed and the company did not erect a smelter. In June 1871 most of the several hundred tons of mined ore was still 'at grass'.[37]

Attempts to mine the lead-silver ore

During 1868 another Melbourne syndicate visited the Quidong area with the aim of prospecting and developing the lead-silver veins. This group initially selected ground on the north side of the Delegate River opposite the operations of the Quedong Copper Mining Company (Figure 1) and floated the Belmore Freehold Silver and Lead Mining Company Limited, registered in New South Wales. Prospecting commenced and in December the resident director J.J. McLeod reported that he had purchased an additional 100 acres of land adjacent to the existing property, where two new lodes of ore had been discovered.[38] The first general meeting of shareholders was held on 18th March at the Globe Hotel in Melbourne and informed that since the end of November, huts had been erected for the men employed at the mine and the lodes opened up with extraction of additional quantities of ore. Machinery had been ordered and would be erected as soon as it arrived on site together with furnaces to smelt the ore. Receipts since 23rd of January had been £630 15s, with just over £562 spent on development. A ballot at the meeting elected Messrs J.J. McLeod, J. Wise, [?] Cooper, G. Roxburgh, [?] Lyons, T.Y. Anderson, J.J. Morrow and R.P. Negus as directors. T. Draper and J.A. Hay had previously been elected auditors.[39]

At the next quarterly meeting it was reported that the manager had built a trial furnace and laid the foundations for a larger one with a furnace house. Machinery

including an engine, twelve head stamp battery, crushing rollers and Brown and Stanfield patent separators had arrived at the site and was being erected. Three main lodes, the Ballarat, Bendigo and Dunolly, had been partially developed and appeared to be 'rich in silver and lead'. It was estimated that 20 men could raise a large supply of ore per week from the Bendigo lode, which cropped out in several places through the property. Several other small lodes had also been discovered. At a later adjourned meeting the directors reported that it had been necessary to supersede Mr B.H. Dods, the mine manager, by the appointment of Captain J.B. Pascoe, late of Adelaide, who had recently visited the mine in the interests of some Victorian capitalists.[40] Captain Pascoe read his report on the mine and suggested that it only needed to be developed to yield 'enormous returns'. This meeting also discussed what action to take regarding Mr J.H. Wymond, the legal manager of the company, who had recently been committed for trial on a charge of obtaining money under false pretences. One shareholder proposed that Wymond be asked to resign, but the majority of the meeting considered this 'very unjust' and passed an amendment to keep him on.[41]

In August 1869 a special general meeting of the Belmore Freehold Silver and Lead Mining Company was called to consider raising additional capital. The directors recommended that the nominal capital of the company be increased to £60,000 in 60,000 shares of £1 each, 48,000 to be considered as paid-up, with 12,000 contributing shares subject to calls not exceeding 1s per month. The plan was that the existing issue of shares be called in and every shareholder allowed four paid-up shares and one contributing share with a liability of £1. This was agreed to by the shareholders and a resolution was also passed to empower the directors to borrow up to £3,000, secured by a mortgage over the mine, plant and property. A report from Captain Pascoe read to the meeting expressed his opinion that if £1,600 were spent on developing the works, a return of £2,800 would be realised in six months.[42] At a subsequent meeting on the 28th of September Captain Pascoe reported by telegram that the engine had been successfully tested on the previous Saturday and that the reverberatory furnace would be finished before the end of the month. The directors revealed that some irregularities in the company's accounts related to the activities and poor account keeping of the previous mine manager (B.H. Dods) had been partly resolved. Some complaints were made about Captain Pascoe, who had apparently made a report for another company with adjoining

claims and a motion was carried to the effect 'that Mr Pascoe be requested to get the sanction of the board before reporting on any land in the neighbourhood'.[43]

The plant and smelter were completed sometime before the end of 1869, but by January 1870 work at the site had almost ceased, many of the men had been discharged and the manager had returned to Melbourne.[44] The completed smelter consisted of two reverberatory furnaces, one for lead smelting and the other for copper (Figures 5 and 6).

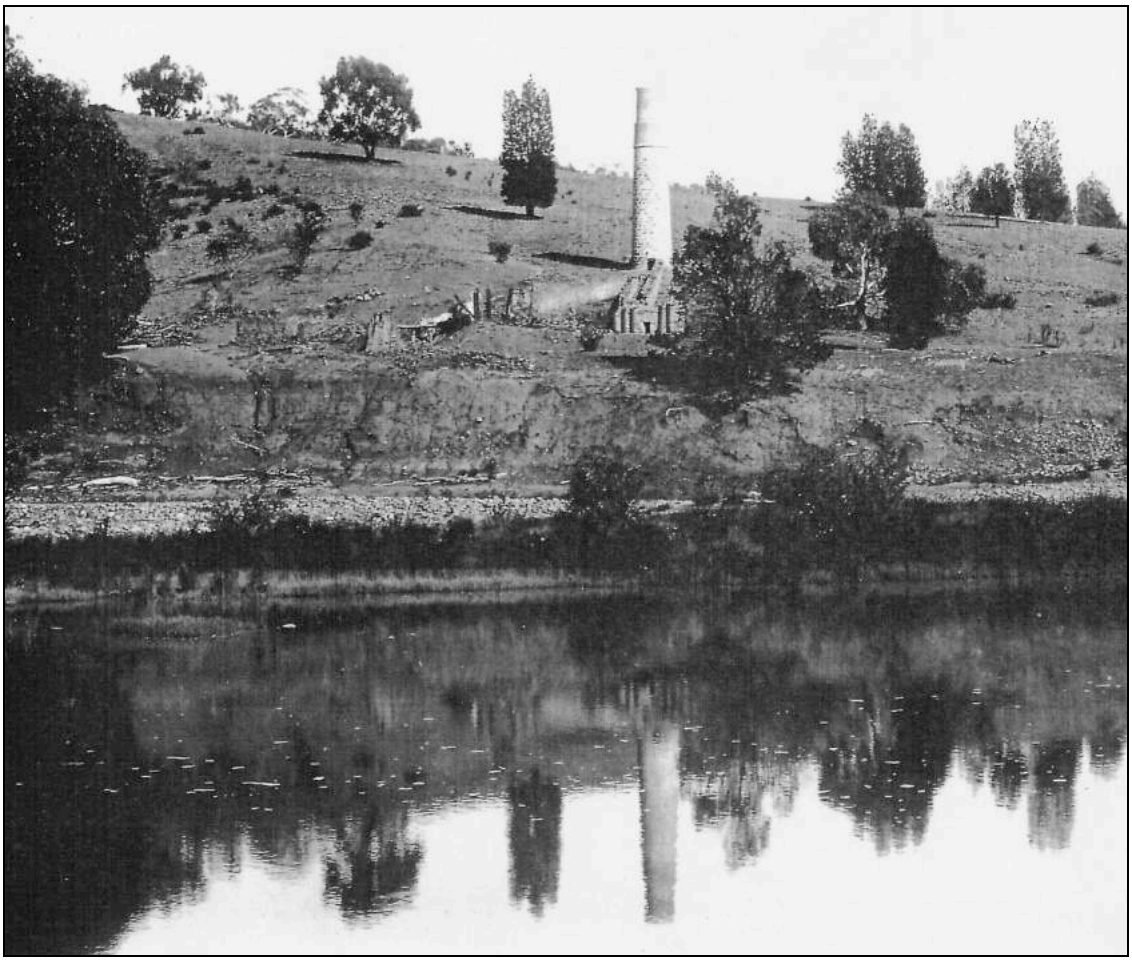
Figure 5: *The Belmore Freehold Silver and Lead Mining Company plant and smelter in 1871, view to the south.*

Source: Photograph Carl Walter, Scenic Views of Victoria and south east New South Wales, ca. 1865-1872, Ref. No. pic-vn4595084. Courtesy National Library of Australia.

Inspection of the smelter by the author in 1980 revealed that it had been used, but not to a great extent, as there was little slag at the site. There was also a small quantity of unsmelted galena-barite ore still next to the crusher site. There is no record of any lead or silver production and it is possible that the smelter did not operate properly, or alternatively, that the supply of ore was too limited. In November 1870 a special meeting of shareholders of the Belmore Freehold Company was called to discuss what action to take against the former mine manager, B.H. Dods, who still had a contract to supply lead to the company from the mines. The shareholders were highly dissatisfied that several thousand pounds had been spent or squandered under his mismanagement

for no result. Dods had asked for more money to fulfil his contract, but the shareholders were most unwilling to oblige. The issue appears to have been resolved by the company being wound up and it was reported in June 1871 that the whole of the company's property, including 1,300 acres of good grazing land, was in the hands of the mortgagee, it then being sold in Melbourne for £60. Total expenditure over the three years of operation had been about £12,000.[45]

Figure 6: *The Quidong smelter in 1920 showing remains of the two reverberatory furnaces constructed by the Belmore Freehold Silver and Lead Mining Company.*



Source: Courtesy Photo collection of the NSW Department of Primary Industries.

During the period 1871-1950 there was intermittent interest and prospecting activity in the Quidong area, but the records appear scant. In June 1881 there was a brief mention in the *Town and Country Journal* of miners working on a new lead mine at Quidong and they were 'expected to touch the solid lode in a short time'.[46] In November 1891 a group of Ballarat investors set up the Quidong Silver Mining Syndicate Company No Liability. This company was registered on the 20th January

1892,[47] and was probably set up to 'capitalise' on the tail end of the 1880s silver boom but there appears to have been little if any activity on the ground.[48] Joseph Carne, Geological Surveyor for the New South Wales Geological Survey, visited Quidong in 1897 and noted the considerable amount of prospecting activity conducted by the Quedong Copper Mining Company on the 'east' (presumably south) side of the Quidong River (Delegate River). He described cellular, gossanous outcrops at 'Clarke's Rock' now known as Clarke's Reef on the south-eastern edge of the Quidong Basin (Figure 1) and commented on the old smelter.[49] In his treatise on copper mining in New South Wales, Carne also mentioned that there was a little prospecting of a gossany outcrop in 1907.[50]

Renewed interest and a new era of exploration

In 1951 A.J.G Walcott held an Authority to Prospect over 3,531 acres of the Quidong area and conducted some prospecting. In 1955 the Silk family of Bombala held an application for a mining lease over two prospects at Quidong containing narrow veins of galena. They tried to interest Lake George Mines Pty Ltd, but after a one day visit in May 1955 the senior geologist and mining engineer, A.G. Palmer, concluded that the prospects were too poor to even warrant sampling, although he did suggest that the hosting limestone might be worth quarrying for agricultural lime.[51] Other parts of the Quidong Basin, particularly the numerous gossans on the southern side of the Delegate River and the site known as Clarke's Reef, appeared more promising (Figure 1). These were in an area under application for an Authority to Enter by Walcott who was able to convince Lake George Mines to take an interest. After a four day inspection in January 1856, A.G. Palmer concluded that:

> Quidong might be a big field. It lies due south of Captain's Flat on a well defined line of base metal mineralisation which extends for 200 miles. The field certainly contains an impressive array of gossans some of which are shown to overlie primary lead mineralisation.[52]

In May 1956 Lake George Mines Pty Ltd decided to undertake the first geological mapping and drilling program of the Quidong area. Initial mapping revealed at least thirty gossans in an area of 12 square miles. The company proposed a scout diamond drilling program of 14 holes costed at £9,000. Drilling commenced in late August but soon encountered difficulties with caving ground and poor core recovery. Due to these problems the program was suspended in December after drilling five of the planned

eight gossans**.** With the exception of one hole (Q7), which was drilled into the Mell's prospect and intersected strong lead and zinc mineralisation, the drilling did not find any economically significant mineralisation. Despite these largely negative results Palmer still considered Quidong a likely prospect because of the favourable geological environment and the limited scope of the testing. He proposed further exploration over a 12 month period involving detailed geological mapping, geophysical surveys and further testing of promising areas by drilling and underground excavation. He suggested that Lake George Mines set up a field team dedicated to mineral exploration. To reduce the risk inherent in the Quidong prospect he proposed that this new organisation explore the full extent of the Lake George (Captains Flat) belt of mineralisation from Sunny Corner in the north to Quidong in the south; in effect a regional exploration program.[53] The known deposits in this belt also included Wiseman's Creek, Burraga, the Peelwood Group, Currawang, Boro, Captains Flat and Dartmoor. It is not clear if this bold proposal was fully adopted, but around this time the company was certainly active in seeking new ore deposits to supplement and replace its declining resources at Captains Flat. However, the Quidong project appears to have been abandoned during 1957 and the Captains Flat mine was closed in March 1962.[54]

The next phase of interest in Quidong started in the late 1960s, coincident with the nickel boom and general increased exploration activity in Australia by multi-national companies. During 1969 Cyprus Mines Corporation began exploring the Bombala region and took an 80 percent stake in a mineral exploration licence area (M.E.L. application 355, later E.L. 196) with George Thomas Griffiths, H.A Wallace and N.G. Silk. A new company called Hastings Exploration N.L. was floated in May 1969, partly to purchase the 20 percent interest of Griffiths and partners.[55] Consulting geologists, Aminco and Associates Pty Ltd, on behalf of Hastings Exploration and under the direction of A.G. Turner, conducted geological mapping and recommended that a soil geochemical survey be carried out over the whole Quidong Basin. A reconnaissance soil survey with a sample spacing of 200 feet was completed by Sempey Exploration Services in October 1969 at a total cost of $7,100. Approximately 1,200 samples were analysed for copper, lead, zinc, nickel, cobalt and silver and four broad anomalous areas were found containing numerous sites with elevated copper, lead and zinc. This work was followed up with further mapping and sampling, culminating in the drilling of ten percussion drill holes in late 1969. In the latter part of 1970 the first geophysical survey

was carried out by McPhar Geophysics, using induced polarisation (IP) and resistivity techniques. A further 20 percussion holes were drilled in early 1971.

During 1970 Cyprus Mines had negotiated a joint venture agreement with Esso Australia Limited and this company became the operating partner in 1971. Peter Lewis, who later joined the Geological Survey of New South Wales, was the project geologist. Esso undertook more extensive soil geochemical sampling and conducted further geophysical surveys over parts of the area using induced polarisation and ground magnetic techniques. They also conducted an electrical survey, using the Mise a la Masse technique, at Clarke's Reef. The whole Quidong basin was geologically mapped at a scale of 1:6,000 and fifteen trenches were dug to assist the mapping and structural interpretation. Between June and November 1972 a 16-hole diamond drilling program was conducted, with most of the holes sited around the margins of the basin and at Clarke's Reef. Two angled holes were directed beneath the old workings of the Quedong Copper Mining Company. The first hole (102-9A) had to be abandoned at 215 feet when it hit an underground drive southeast of Lander's shaft and the second intersected shales followed by massive limestone with disseminated pyrite, but only traces of copper. Overall, drilling around the basin revealed several zones of sulphide mineralisation, but these were considered too low-grade and limited to be of economic interest.[56]

In 1978 exploration licenses (E.Ls 1147 and 1148) covering the Quidong Basin were granted to Western Mining Corporation Limited. Between 1978 and 1980 a team led by project geologist D. McP. (Dave) Duncan conducted detailed mapping and extensive stream sediment and soil geochemical surveys, analysing for copper, lead, zinc, manganese, iron and arsenic. New work also included an electromagnetic geophysical survey (using the TEM technique) of four sites of interest outlined by previous company surveys.[57] This was followed in 1981-82 by further mapping and soil sampling under the direction of W.J.L. (John) Brooke. A gravity survey was commenced but not completed. During and following this work, four diamond holes were drilled in the Clarke's Reef area and a fifth hole directed at a TEM anomaly near the Mell's prospect. Down-hole geophysical surveys were conducted during the drilling using the SIROTEM technique, but a malfunction with the equipment meant that the results were equivocal and had to be ignored. Intervals of mineralisation were intersected at Clarke's Reef in holes CRD1 and CRD4. The most significant intersection was 7m of 7.2 percent zinc, 4.02 percent lead and 10.6 g/t silver in CRD1. In early 1983

Western Mining were winding down their activities in New South Wales and these results were not considered encouraging enough to maintain the tenements so they were relinquished.[58]

Following the departure of Western Mining in July 1983, the Quidong area was quickly taken up by Plagolmin Pty Ltd, within a new exploration licence area (E.L. 2004).[59] This company commenced exploration in 1984 by carrying out some geological reconnaissance and limited stream sediment sampling to check previously defined geochemical anomalies. Work was initially restricted by access problems related to landowner objections, but by July these difficulties were largely overcome. A drilling program was proposed for early 1985, but little field work was completed. During August-September four diamond core holes were drilled at Clarke's Reef. These were designed to test the extent of the mineralisation found by Western Mining. All holes encountered low to medium-grade sulphide mineralisation with the best intersection grading 3.6 percent Zn, 1.6 percent Pb, 0.08 percent Cu and 6.3 g/t Ag over 27m and another 11m interval 4.86 percent Zn and 1.42 percent Pb. Sampling of gossanous material along faults in the north-western area of the Quidong Basin (north of the Delegate River) also revealed some gold concentrations, with samples containing up to 7 g/t.[60] In November 1987, immediately following the 1987 share market crash, the exploration licence was transferred to Delta Gold N.L. as part of an existing joint venture arrangement.[61] Reassessment of all previous work and drill core led to a recommendation that surface prospecting and further drilling should test gold as well as base metal targets. The former was encouraged by results from additional rock chip sampling in the north-west of the basin, referred to as Adam's Zone, revealing 8.25 g/t gold over 2 m and 1.96 g/t over 10 m. Further testing of Clarke's Reef was also suggested. The work by Plagolmin had indicated a small geological resource of 935,000 tonnes with a combined lead-zinc grade of 2-4 percent. This was clearly sub-economic, particularly for a required underground mine, but it was considered that the mineralisation was still open along strike.[62] By the end of 1990 Delta Gold had completed grid sampling of rocks and soils at four sites of interest in the Quidong Basin, sampled the old workings, including some of the underground exposures, conducted a ground magnetic survey and trench sampling of the Adam's Zone and completed a six-hole reverse circulation, percussion drilling program for gold at the Adam's Zone. Results from the drilling were disappointing, revealing typical widths of

1-2 m of 0.5 g/t gold below the oxidised, weathered zone and a best intersection of 3 m at 1.08 g/t.[63]

Despite a setback on the gold, Delta Gold continued with the broader exploration program at Quidong. During 1991, the company took out a new exploration licence (EL 3710) over the main part of the Quidong Basin and completed a gravity survey covering the old copper workings and the southeastern corner of the basin. This geophysical survey revealed a substantial gravity anomaly under the Clarke's Reef area, which was then tested along its northern extension by two diamond drill holes. One hole intersected zones of massive sulphide, but these were mainly pyrite and low in base metals (<0.46 percent) and gold (<0.14 g/t). Both holes also revealed another thin (3-8 m) zone of low-grade mineralisation higher in the sequence. These limited but tantalising results prompted a hiatus in field activity while all previous data sets were re-appraised.[64] In 1993 a gas vapour phase (GVP) survey was conducted over the Clarke's Reef prospect with a follow up survey in 1994 and limited field work and sampling through to 1996. Based on the re-appraisal of existing data and a new focus on potential stratabound lead-zinc mineralisation, it was proposed to carry out some deep drilling. Another electromagnetic survey, using the SIROTEM Mark 3 method, was completed in 1997 to assist in locating potential sites for the deep drilling. The company then attempted to attract a joint venture partner to help with the cost of this new phase of exploration.[65]

. At the end of 1998 Delta Gold allowed their Quidong tenement to expire following unsuccessful attempts to attract an earn-in joint venture partner. This company had certainly been the longest and most persistent explorer of the Quidong Mineral Field. The senior geologist for the project, Bret Ferris, concluded that:

> The potential of the Quidong Basin to host concealed stratabound basemetal mineralisation remains high, supported by the numerous zones of geochemical anomalism around the basin margin and related to cross-structures within the basin. The western margins of the basin have additional interest for associated gold mineralisation. … Further exploration will require a degree of speculative, stratigraphic drilling adjacent to major structures associated with known mineralisation.[66]

During the most recent mining boom, which foundered during 2008, the Quidong Mineral Field remained an enigmatic site of attention. A new company, Stirling Minerals Ltd, was floated in May 2007, largely on the basis of prospects at Quidong. This company took out tenements totalling 273 square kilometres over the Quidong

Basin and surrounding region (ELs 5671, 6888, 5429). In early 2008 Stirling completed a detailed airborne (Helimag) magnetic and radiometric survey to clarify the structural controls on mineralisation and identify possible drilling targets.[67] This survey identified some of the faults in the Quidong Basin and also indicated a large magnetic anomaly beneath the Early Silurian sedimentary rocks south of the basin, suggesting the presence of a granite intrusion at depth. Due to the current economic downturn and low commodity prices the company has decided to reduce exploration spending to the minimum required to maintain the tenements 'whilst waiting for new opportunities that come with appropriate funding'.[68]

The lure of Quidong

Geologists and prospectors have always been drawn to the Quidong area by its obvious surface signs of mineralisation, structural complexity and the juxtaposition of chemically reactive limestone, sulphide-rich shales and intruding porphyry dykes. These encouraging features were first noted by W.B. Clarke, and the earliest miners described the surrounding slate formation 'as disjointed as killas, and resembling that enclosing rock of the copper-mining districts in the south west of England'.[69] The rocks making up the Quidong Basin are the same late Silurian age as those hosting major ore deposits later discovered further north at Captains Flat and Woodlawn.

Within the Quidong Basin there are three distinct types of mineralisation. The first comprises pyrite-rich shales and siltstones with minor copper-lead-zinc sulphides. These rocks occur in the lower part of the stratigraphic sequence and around the margins of the basin. They probably formed from hot spring exhalations into the basin when it was a submarine environment. The second type consists of more massive sulphide bodies containing copper, lead, zinc, silver and gold, developed around and along major faults that cut the pyritic sediments (e.g. at the Quedong Copper Company workings and Adam's zone). These bodies probably formed by later remobilisation of sulphides from the underlying rocks or possibly as veins related to underlying igneous intrusions. The mineralisation at Clarke's Reef has stratabound characteristics and appears to be a combination of the first two types. The third type are narrow, irregular veins of galena-barite with silver, minor copper and zinc sulphides that formed by sulphide remobilisation along faults in the limestone overlying the pyritic shales. Drilling on the western side of the Quidong Basin has also intersected minor skarn-type mineralisation in limestone adjacent to porphyry dykes.[70] The host rocks at Quidong

were strongly folded and faulted when the basin was deformed and this process assisted sulphide remobilisation and concentration into some of the lodes and veins.[71]

Early prospectors were attracted by the extensive, rubbly surface mineralisation of secondary copper carbonates. Below the surface these seemed to disappear or pass into pyrite-rich mineralisation with only minor copper sulphides. This phenomenon appears to have resulted from the extensive surface lowering and accompanying weathering of the soft rocks in the Quidong Basin during down-cutting by the Delegate River. Copper released from the weathering primary sulphides was fixed and concentrated by abundant carbonate in the host limestone. This produced a large surface accumulation of copper carbonates from the small primary concentrations and explains why a definite underlying copper lode could not be found by the Quedong Copper Mining Company. The outcropping lead-silver veins were also attractive targets for the early miners, being very rich in galena and easily mined. They have some similarities to the galena veins at Glen Osmond near Adelaide in South Australia, which are believed to be the first metalliferous deposits worked in Australia (and also where Captain Pascoe had obtained much of his experience), however they proved very narrow and disjointed. The early miners did not have the advantage of diamond drills and the only method of subsurface exploration was by exploratory shafting and driving, a labour intensive approach requiring some luck.

Modern explorers have been attracted by the numerous scattered surface showings and gossans, as well as strong geochemical anomalies in soil and stream samples. Numerous targets have been tested by drilling and although there have been some encouraging intersections, the sulphide bodies are structurally complex and have proved difficult to interpret. The concentrations of gold in gossanous material along faults have probably been enriched by surface weathering of gold-bearing primary sulphides. Much of the early drilling was concentrated on the margins of the Quidong Basin targeting widespread soil anomalies related to the pyritic sediments. Geophysical surveys have indicated interesting electrical and magnetic anomalies and some of these have been tested with limited success. Most of the deeper parts of the basin have still not been drilled.

Conclusions

The Quidong Mineral Field has had a long history of exploration interest, remarkable in view of the absence of any economic discoveries. This history also highlights the

speculative aspects of mining and the inherent uncertainties of mineral exploration, even using scientific methods. Almost the complete array of exploration techniques has been applied at Quidong. Generations of prospectors and geologists, starting with Australia's 'father of geology', have been intrigued by the site. This fascination has been exploited and explored by mining promoters and modern mining companies alike. Over a 150-year period large amounts of money have been spent (in excess of $6 million, Table 1), but nothing mineable has been found. The Reverend W.B. Clarke's prediction of a profitable mining field has not been realised, but to many optimists it seems that 'the jury is still out'.

Table 1: *Groups that have explored the Quidong Mineral Field and their expenditures. Expenditures also shown recalculated to constant A$ deflated by CPI to 2008.*

Dates	Company or Group	Expenditure	Expenditure Constant A$
1864	'Adventure Company'	?	
1865-1868	Quedong Copper Mining Company Ltd	£13,600	1,095,700
1868-1870	Belmore Freehold Silver & Lead Mining Company Ltd	£12,000	1,012,180
1880-1881	Not known	?	
1892	Quidong Silver Mining Syndicate	£830	93,200
1907	Prospectors	?	
1955-1957	Lake George Mines Pty Ltd	£10,000 est.	253,680
1969-1972	Cyprus Mines Corporation - Esso Ltd - Hastings Exploration NL	$190,406	1,531,280
1979-1982	Western Mining Corporation Ltd	$469,724	1,268,000
1983-1986	Plagolmin Pty Ltd	$103,131	210,830
1987-1989	Delta Gold NL – Plagolmin Pty Ltd	$180,866	297,100
1990-1998	Delta Gold NL	$213,447	287,800
2007-2008	Stirling Minerals Ltd: Exploration - Administration -	 $170,000 $350,000	 170,000 350,000

Source: Company reports and open file reports held by NSW DPI. CPI data from ABARE.

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My thanks to the National Library of Australia, the Menzies Library Australian National University, Canberra and the State Library of New South Wales, Sydney for assistance in obtaining information for this article. The NSW Department of Primary Industries, Maitland and the State Library of Victoria, Melbourne gave permission to reproduce some images held in their collections. Jodie McQueen helped track down information in the Victorian Public Records Office. Don Perkin assisted in re-calculating exploration expenditures for the Quidong area to constant dollar values deflated for Australian CPI. Also thanks to the late Buddy Stevenson for access to his property at Quidong and to staff of the former Western Mining Corporation, particularly Dave Duncan and John Brooke, for help with field work at Quidong. Bill Stanley, Bill Walker and Rob Reynolds kindly provided information on the corporate history of Plagolmin Pty Ltd and Delta Gold NL. Comments from two anonymous reviewers helped improve the article.

Glossary of some terms used in the text
Barytes (Barite) = barium sulphate ($BaSO_4$).
Drive = a horizontal underground opening, in some cases along the reef or orebody.
Galena = lead sulphide (PbS), may also contain small amounts of silver.
Gossan = weathered (commonly iron oxide rich) weathered outcrop of a sulphide ore deposit.
Killas = Cornish term for sedimentary rocks metamorphosed by heat from intruding granite.
Lode = a generally tabular mineral deposit in solid rock, commonly related to alteration of the parent rock, rather than in a vein or reef.
Mise a la Masse = (excitation of the mass) an early developed electrical geophysical method used for delineating conductive subsurface orebodies. An electrode is placed in the body (e.g. in a drill hole) and a second some distance away causing the body to radiate electric current. Lines of equal potential can then be mapped using two mobile probes.
Stratabound = in reference to an ore deposit confined to a particular strata or stratigraphic layer.
Sulphurets = and old term for metal sulphides.
TEM = (transient electromagnetic) a geophysical technique used for detecting electrically conducting ore bodies by examining the way in which an induced electromagnetic field behaves over time (SIROTEM is a particular type of TEM developed in Australia by CSIRO).
Whim = a large horizontally rotating wooden winding drum, powered by a horse harnessed to a wooden shaft, similar to a capstan. One or both ends of the rope are fed through pulleys on a shaft headframe to pull one or two skips up and down the shaft.
Whip = an angled pole over a shaft with a pulley and rope used to haul a bucket or skip from the shaft by a horse pulling on the rope.

Units
1 (long) ton = 1.01605 tonnes; 1 pound = 0.454 kg; 1 inch = 25.4 mm; 1 foot = 0.3048 m;
1 yard = 0.914 m; 1 mile = 1.609 km; 1 square mile = 2.59 sq km; 1 (imperial) gallon = 4.5461 litres.

Pre-decimal currency
£1 (pound) = 20s (shillings) and 1s = 12d (pennies).

Endnotes

[1] Letter from the Colonial Secretary, New South Wales to Clarke, in A. Moyal, *The Web of Science: The scientific correspondence of the Rev. W.B. Clarke, Australia's pioneer geologist*. Australian Scholarly Publishing, Melbourne, 2003, pp. 310-312.
[2] W.B. Clarke, *Researches in the Southern Gold Fields*. Reading and Wellbank, Melbourne, 1860, p. 29.
[3] *Ibid*., pp. 7-8; 42; 153-154; Clarke thought that the best elevations were around 500-2,000 feet and certainly below 3,000 feet, and that close to the 149th meridian was where most gold deposits would be found. Later he had to modify these ideas in the light of new discoveries, including in other parts of the world.

[4] Letter by Clarke to Sir Roderick Murchison, in Moyal, *The Web of Science*, pp. 348-351; Clarke, *Researches,* pp. 155-156.
[5] Clarke, *Researches*, p. 144. The locality name 'Quedong' (also spelt 'Quidong') probably derives from the local aboriginal word 'Quidong' meaning ice or frost, as recorded by John Lhotsky in his visit to the Monaro in 1834. Lhotsky compiled a short vocabulary of 163 words and phrases from young people between the ages of 13 and 19. Being largely treeless and grassy, the Quidong basin is a natural frost hollow with thick frost in the winter. J. Lhotsky, *A Journey from Sydney to the Australian Alps, undertaken in the months of January, February and March 1834: being an account of the geographical and natural relation of the country traversed its Aborigines &c,* J. Innes, Sydney, 1835, 110 pp.
[6] Clarke, *Researches,* p. 156.
[7] J.E. Carne, *The Copper Mining Industry and the Distribution of Copper Ores in New South Wales*, 2nd edition, Government Printer, Sydney, 1908, p. 374.
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[12] *Ibid*; N. Taylor, 'Report on geology of the Snowy River district and the boundary line between Victoria and New South Wales', p. 17; *Memorandum of Association of the Quedong Copper Mining Company (Limited),* PRS 567, Unit 447, File 4646, Public Records Office of Victoria [hereafter PROV].
[13] T. A. Darragh, 'The Geological Survey of Victoria under Alfred Selwyn, 1852-1868 – Appendix: Staff List' *Historical Records of Australian Science,* 7(1), 1987, p. 17.
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[15] B. McGowan, *Lost Mines Revisited*, Barry McGowan, Canberra, 1996, pp. 170, 216-217, 223.
[16] *Ibid.* pp. 77-78.
[17] J. Enever, 'Not for Want of Trying The History of the Cooper's Creek Copper Mine, Victoria', *Journal of Australasian Mining History*, vol. 6, pp. 150-173.
[18] G. Blainey, *The Rush That Never Ended, A History of Australian Mining*, Melbourne UP, Carlton, 1963, 2nd edition, 1969, 389 pp.
[19] *Reports of the Quedong Copper-Mining Company Limited*, 8th August 1865, C.B. Demaine, Printer, Melbourne, pp. 3-4, State Library of NSW, call no. 86/20; 'The Quedong copper and lead mines, New South Wales', *Dicker's Mining Record*, 1 August, 1865, vol. 5, pp.3-4.
[20] *Reports of the Quedong Copper-Mining Company Limited*, 8th August 1865, pp. 4-12; 'Shipping Intelligence – Imports May 19', *The Argus*, 20 May 1865, p. 4.
[21] 'The Quedong copper and lead mines, New South Wales', *Dicker's Mining Record*, 1 August 1865, vol. 5, p. 3. At the time the Burra Burra (or Monster) mine in South Australia was the richest and most famous copper mine in Australia and the malachite rich ores at Quidong also resembled those at this mine. *Reports of the Quedong Copper-Mining Company Limited, 8th August 1865*, p. 7.
[22] *Ibid*., p. 9.
[23] *Ibid*., pp. 3-4.
[24] *Ibid*.; W. Allen, 'Resident Director's Report', *Reports of the Quedong Copper-Mining Company Limited*, *8th August 1865*, pp. 10-12.
[25] *Reports of the Quedong Copper-Mining Company Limited*, 8th August 1865, pp. 4-16.
[26] *Ibid*.; 'Mining Meetings – Quedong Copper Company', *The Argus*, 8 August, 1865, p. 6.
[27] 'Quedong Copper Mining Company', *Dicker's Mining Record*, vol 5, New Series, 24 October 1865, p. 260; *Ibid.,* 31 October 1865, p. 280; *Ibid*., 21 November 1865, p. 334.
[28] 'Quedong Copper Mining Company (Limited)', *The Argus*, 3 February 1866, p. 5.
[29] 'Mining Meetings – The Quedong Copper Mining Company (Limited)', *The Argus*, 21 June 1866, p. 5.
[30] *Ibid*., 17 July 1866, p. 6.
[31] *Ibid*., 2 August 1866, p. 7.
[32] *Ibid*., 8 February 1867, p. 5.
[33] *Ibid*., 1 June 1867, p. 7.
[34] *Ibid*., 7 August 1867 (supplement).
[35] *Ibid*., 7 August 1868, p. 7.

[36] *Ibid*., 8 February 1869, p. 6; the New Adventure Company had been formed after the Adventure Company had floated part of its leases to form the Quedong Copper Mining Company, retaining the land leased from the New South Wales Government that it held outside the leases negotiated with Captain Campbell; 'The New Adventure Company' *Dicker's Mining Record*, vol. 5, New Series, 1 August 1865, p. 4.
[37] 'The mineral district of Bombala', *The Illustrated Australian News for Home Readers,* 17 June 1871, pp. 125-126.
[38] 'The Mines – Belmore Freehold Silver and Lead M. Co., Limited N.S.W.', *The Melbourne Age*, 31 December 1868, p. 3.
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[40] Captain Pascoe was reported to have great practical experience in silver and lead mining. It appears that this is the J.B. Pascoe who was mine captain at the Glen Osmond silver-lead mines near Adelaide from 1846-55 and also involved with the Strathalbyn and Nuccaleena copper mines in South Australia. See, R. Both and G. Drew, 'The Glen Osmond silver-lead mines, South Australia: Australia's first metalliferous mines', *Journal of Australasian Mining History*, vol. 6, pp. 21-45; 'Strathalbyn Mine', *South Australian Mining Journal*, 13 June 1850; *Flinders Ranges Research*. http://www.southaustralianhistory.com.au/nuccaleena.htm.
[41] 'Mining Meeting – Belmore Freehold Silver and Lead Mining Company (Limited)', *The Argus*, 12 June 1869, p. 6: *ibid*., 28 June 1869, p. 5; 'The mineral district of Bombala', pp. 125-126.
[42] Mining Meetings – The Belmore Freehold Silver and Lead Mining Company (Limited)', *The Argus*, 28 August 1869, p. 6.
[43] *Ibid*., 16 September, p. 5; *ibid*., 29 September, p. 7. The total amount of outstanding irregularities related to Dods was £1,362 19s 8d and mostly involved missing original invoices, including for 6 days cab hire, wages paid without vouchers, cartage and petty cash.
[44] 'Mining Items – New South Wales', *Town and Country Journal*, 29 January 1870, p. 13.
[45] 'The mineral district of Bombala', pp. 125-126.
[46] 'Mining Items – New South Wales – Quidong', *Town and Country Journal*, 11 June 1881, p. 1126.
[47] Memorial of Registration and Agreement, Rules and Regulations for the Quidong Silver Mining Syndicate Company No Liability, PRS 567, Unit 447, File 4646, PROV.
[48] Blainey, *The Rush that Never Ended,* pp. 149-151.
[49] It is not clear why this locality was called Clarke's Rock or Reef as it is at the other end of the basin from where Clarke made his original copper-lead discovery and there appears to be no record of him describing this site, although he may have visited it. J.E. Carne, *The copper-mining industry and the distribution of copper ores in New South Wales*, NSW Department of Mines, Mineral Resources no 6, Government Printer, Sydney, 1908, pp. 374-375.
[50] *Ibid*.
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[53] A.G. Palmer, *Quidong exploration*, 24 September 1956, pp.13-15; A.G. Palmer, *Quidong scout drilling*, 17 January 1957, pp. 16-24.
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[68] T. King, *Stirling Minerals Limited, quarterly report,* 30 January 2009.
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