Royal Australian Survey Corps Association

ACT Newsletter

In This Issue – March 2013

Issue Note

By Rob McHenry

First issue for the year and I must thank Peter Jensen for his contributions. Additionally, my thanks to Paul Wise (ex-Natmap) for allowing us to publish his story on the Johnson Ground Elevation Meter with many images including some of our John Hook.

100 Years Ago – Survey Section Royal Australian Engineers (Permanent) in 1913

By Peter Jensen

By the end of 1913 the Survey Section Royal Australian Engineers (Permanent) comprised 15 members, including three enlisted/appointed in 1913: AH Barrett, AJ Clements, HPG Clews, RV Hoddinott (enlisted 23 Jan 1913), EF Davies, JJ Lynch, JH McDonald, RJ Mollross, AS Murray, Officer Commanding Lieutenant CV Quinlan (appointed 17 Mar 13), CV Radcliff, JJ Raisbeck, HA Roseblade, H Rossiter, NL Shiels (enlisted 15 Sep 13). Three Section members were discharged during the year: Warrant Officer Class One GE Constable, the second Australian enlisted in the Section and who tragically took his own life with his service pistol in his office (1 Jun 10 – 15 Jul 13), Sergeant R Wilcox one of the original four Royal Engineer sappers and who returned to England (11 Apr 10 - 7 Jun 13) and Sergeant CA Favier (1 Aug 12 - 31 Mar 13).

Technical methods were under the control of the Australian Intelligence Corps with the geospatial framework for topographical plane tabling based on cadastral maps. By then deficiencies in this method of producing standard military maps were becoming evident to the General Staff, and in Aug 1913 Major Cyril Brudenell White (later Lieutenant General Sir), Director of Military Operations, sought advice from RE officers serving in Australia. Consequently White was convinced that 'some efficient system of triangulation is an essential to further progress'. Two months later Lieutenant Quinlan took the matter further proposing to the General Staff that the field element of the Survey Section be reorganized into a trigonometric sub-section and two topographical sub-sections. He went on to suggest a change of operational control of the Survey Section to the General Staff and moreover that the Section be freed from direction of both the Australian Intelligence Corps and Royal Australian Engineers. There were no significant changes to command and control arrangements in 1913.

Meanwhile work continued for one-inch-to-one-mile military map production around military high priority areas of Sydney, Melbourne and Adelaide expanding to include assistance to Intelligence Corps mapping around Perth-Fremantle. By August 1913 the first maps to be printed - Newcastle and Morna Point in New South Wales - were at the Government Printers in Melbourne and field sheets of Cranbourne, Anglesea, Western Port, Geelong, Woolamai in Victoria and Canberra were complete and in-work being fair drawn in 3rd Military District Draughting Section in Melbourne.

Indeed the fair drawn sheets of Western Port – Woolamai, which were compiled using cartographic specifications similar to those of the UK Ordnance Survey, were approved by the General Staff as the Australian standard for one-inch-to-one-mile military maps.

Produced by Peter Jensen from the official history of the Royal Australian Survey Corps 1915-1996, Australia's Military Map-Makers by C.D. Coulthard-Clark and The Royal Australian Survey Corps 1915-1990 by Lieutenant Colonel Clem Sargent

Balcombe Barracks Commemoration - 2013

The following is reproduced from the Australian Army Apprentices' Association (AAAA) website:

The Mornington Peninsula Shire Council (MPSC) have over the years done a considerable amount of work to preserve the Balcombe military heritage precinct as part of their plan to recognise areas of historical significance of the Mornington Peninsula. The Australian Army Apprentice Association (AAAA) together with MPSC has undertaken to advance this concept by the addition of storyboards and plaques relating to the units that occupied Balcombe in the last century, and at the same time refurbish those existing items that are so desperately in need of upgrade and maintenance. Balcombe has a very colourful history not only for those that soldiered there but also for the local community that so willingly supported them over the best part of the last century.

A few years ago AAAA Patron Lt Gen Ken Gillespie when serving as the Chief of Army suggested that perhaps more could be done in this regard and asked that the AAAA to consider, develop a plan and approach the MPSC. This occurred fairly quickly with good results but as time and circumstances evolved and despite the best efforts of our people initially, the project stalled.

It has since been reactivated, is now a goer and we are delighted to be able to advise where we are at right now. The MPSC is a strong supporter of the project and jointly with the AAAA sub committee and the Balcombe Grammar School, detailed planning is well underway to make it happen.

2013 also represents the 70th anniversary of the 1st Div USMC being repatriated to Balcombe after their successful Guadalcanal campaign. The 4th of May 2013 marks the 71st anniversary of the start of the Battle of the Coral Sea. The Australian Army Apprentices took part in the annual celebration of this battle for many years by being the Army component in the allied forces contingent that marched through the City of Melbourne.

It was decided that all of this activity would attract many "Balcombe Old Boys and Girls" who would wish to be a part of the proceedings. So AAAA Events have come up with a number of activities to make this a most memorable few days, and probably the last time that Balcombe, Mornington and the district as a whole will appear on our radar.

This gathering is inclusive of all those units and personnel that served in Balcombe Barracks ie, Apprentices, Signals, Survey, Music, US Marines, WRAAC and including staff.
The Registration Form for this "final" event can be downloaded from:
www.austarmyapprentice.org

RADIO BROADCAST

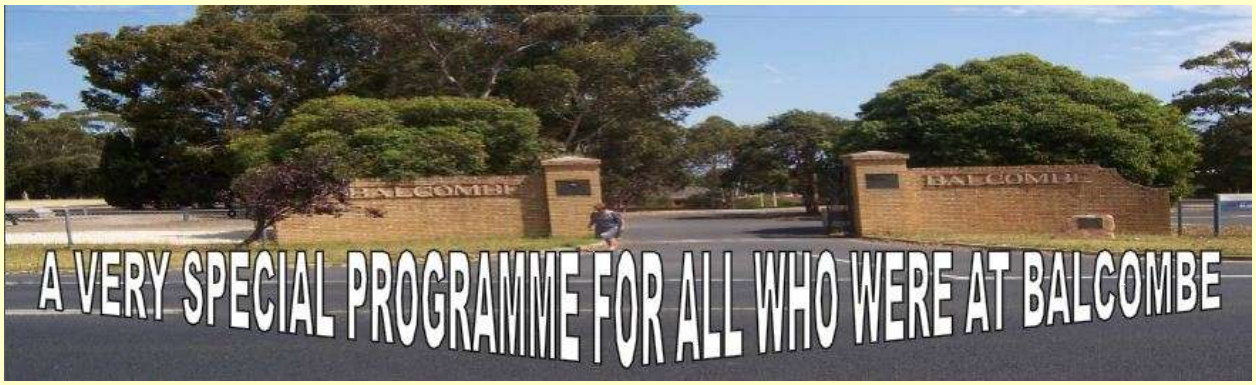
By Rob McHenry

I have received a few emails over the last couple of months from an ex SIG "OLD BALCOMBE BOY" who presents a weekly program called "On the Bandwagon" for the community station City Park Radio in Launceston, Tasmania. This program is broadcast every Monday at 4pm.

As an adjunct to the Balcombe Barracks Commemoration celebrations, he is putting together a special program that will feature the marches of the various corps that served at Balcombe including an instrumental version of "Wandering the King's Highway" if he can locate one.

The idea of the Radio broadcast is to publicise the event as much as possible across Australia before the event takes place. The programme will be broadcast via satellite across Australia to the community stations that are part of the network. The idea is to let those who do not know about the event look into doing something about attending if they wish to. Regimental marches and commentary on the units that were at Balcombe will be presented during the programme.

The broadcast will be conducted on Monday 22nd April from 4 to 5 PM EST and will be repeated Saturday 27th April 12 to 1 PM EST.



Navigating the Great Sandy Desert

By Peter Jensen

Survey Corps units were often called upon to provide services to the Defence Force Assistance to the Civil Community program, for example providing teams of soldiers and maps to Army support for bushfire fighting during the fire season and providing guards and speakers for Anzac Days.

In mid-1980 Commander 5th Military District tasked 5th Field Survey Squadron to provide survey/navigation support to the Western Australian Historical Society which was sponsoring an expedition into the Great Sandy Desert of Western Australia in part to retrace the Calvert Scientific Expedition (1896) led by the South Australian Government surveyor/explorer Lawrence Allen Wells.

Wells' expedition was tasked to explore the central region of Western Australia, between the east-west expeditions of Warburton (1873) at about latitude 20 deg 30 min south, and Giles (1876) about 240 miles to the south at latitude 24 deg 30 min south, for mineral resources and pastoral lands and make collections of botanical, zoological and geological specimens. Wells was suitably qualified for his appointment having acted as a surveyor on marking the Queensland – Northern Territory boundary, being surveyor of the remote pastoral leases of northern South Australia and having assumed leadership of the 1891-92 Elders Scientific Exploring Expedition of north-west South Australia. His appointment was endorsed by the Council of the South Australian Branch of the Royal Geographical Society of Australasia which was to control and manage the expedition.

The 1896 exploration ended in tragedy with the deaths of two explorers, Wells' cousin and second-in-command Charles Wells (Surveyor) and George Jones (Mineralogist and Collector of Native Vocabularies). They perished together trying to find Joanna Springs (Aboriginal names Biggarong or Pikurangu Spring) which was found, named and surveyed by Colonel Peter Warburton on his east-to-west exploration from Alice Springs to the Oakover River. Lawrence Wells found Joanna Springs while searching for his missing colleagues, finding that the position of the springs as reported by Warburton was about 15 miles west of his observed longitude. Since 1896 there remained the question as to whether there was a spring fed water at the position reported by Warburton and whether the spring found by Wells was indeed Joanna Springs. The aim of the 1980 expedition was to answer these questions.

Other 1896 party members were George Keartland (Naturalist and Botanist), James Trainor (Cook and Assistant) and two Afghan cameliers, Bejah Beloch and Said Ameer. Wells gathered his expedition team, scientific instruments and expedition equipment together in Adelaide, departing there on 24th May 1896 for the voyage by ship to Geraldton. Lawrence and Charles Wells travelled by train from Albany to Perth to meet with the Premier of the colony of Western Australia, Sir John Forrest, who briefed them on his experiences of his west-to-east journey in 1874. Wells was asked to watch for any traces of Ludwig Leichardt whose expedition had been missing since 1848 while attempting to cross the continent from east-to-north-to-west. From Geraldton they travelled by train to Mullewa where they bought 20 camels mainly as pack animals. Then the caravan headed on the 300 mile track to Lake Way which was the last settlement before the desert and where they busied themselves writing letters to Adelaide. From there they travelled in a north-easterly direction for about 200

miles to find an excellent supply of water at Brockman Creek where Wells established his first depot. By then the caravan had covered about 500 miles in 49 days and the camels needed resting.

I must have been the Troop Officer with least to do in the Squadron - although being Assistant Treasurer of the Karrakatta Barracks Officers Mess was very time consuming as I spent every morning trying to sort out the daily bar chits of which there were many - as I was appointed by the OC Major Jim Corless to act as navigator/surveyor for this task. The only advice to me from the OC was along the lines of not getting the expedition lost and ending up like the explorers.

Our expedition was led by medical doctor Bill Peasley who had been a medical officer of the Royal Flying Doctor Service for many years and had a great historical interest in the desert areas of Western Australia, and the Aboriginal people who had lived there. He had been into the desert many times and rescued Aboriginals from near starvation and thirst. Bill lived not far from where I lived in Victoria Park and over a few weeks we spent the nights planning the trip which was hoped to not only solve the mystery of Joanna Springs but to locate the other water wells found and named by Wells in 1896 - Midway, Separation, Sahara and Adverse. In fact we would have to find good water somewhere as we could not carry enough drinking water for the entire expedition.

I duly plotted the expedition routes of Wells and Warburton from their journals onto Series R502 scale 1:250,000 maps and I also annotated a set of Wild RC9 super wide angle mapping quality aerial photography with the expedition routes. It appeared to me that with the maps, overlapping air-photos, pocket stereoscope, hand-held prismatic magnetic compass, vehicle odometer readings and pacing I should be able to steer a vehicle course through the sand-ridges to find the wells and follow the explorer's route. I also took a Wild T2 theodolite, chronometer, watch, barometer, thermometer, star almanac, star atlas and scientific calculator for circum-meridian sun and star altitudes for latitude and star Saint Hilaire position-lines for simultaneous latitude and longitude, mainly as back-up to my primary navigation method. I had a copy of Wells' journal which described in detail his course, the landscape, vegetation, geology and bird life around each of the waters. This was to be a great advantage in finding the water wells and soaks.

Three other of our expeditioners were from Perth and Adelaide, one a vehicle mechanic and another the author of the book *To the Great Gulf – The Surveys and Explorations of L.A. Wells*. Another two were to met us on the Canning Stock Route before we headed north into the red sand-ridges of the Great Sandy Desert. We were also to meet with two Aboriginals from different tribes which had lived in the area – one man from Jigalong in the south and one from the area south of Fitzroy Crossing in the north of the desert. The vehicles were a mix of old and fairly new – Bill's old ute style long wheeled base petrol Land Rover which had been into the deserts many times, a short wheeled base petrol Toyota Land Cruiser and a long wheeled base diesel Land Rover. Our safety system was a High Frequency radio link through the Meekatharra Royal Flying Doctor Service (RFDS) base which maintained a 24 hour radio watch. And we had our own medical officer in Bill.

On the day of our departure, Saturday 19th July, Bill called to pick me up from home, leaving my wife Jenny with mouth agape, as she looked at this weird old Landrover with seat on-top (greater visible horizon in the desert) and over loaded with 44 gallon drums of drinking water and food and sugar bags of food. We were to eat, as far as practicable, what the 1896

expedition had lived on: flour, sugar, tea, potatoes, pumpkins, cabbages, preserved meats of pork, bacon and beef, eggs and tinned items of milk, meat, cheese, vegetables and fruit.

Bill's Landrover with Mac in 'his' seat – would not pass the OH&S test today

We headed north to Mount Newman then out to Jigalong to pick up our Aboriginal guide Girrawiddi (Mac) of the Mandjildjara tribe which had lived in the southern part of the Great Sandy Desert. Mac had 'come in' from the desert as a boy but the smile on his face as he showed us family camp sites, rock water holes and familiar landscape features said it all. From there we joined the Canning Stock Route up to Well 24, which was the start point for my navigation expertise heading 30 miles east to find Midway Well from the 1896 exploration.

On 10th August 1896 Wells departed from his Brockman Creek depot, heading east then north, on about the 124th deg east meridian, with a light reconnaissance team and seven camels with water and supplies for six weeks. He was to look for the next good water for his expedition. This was easier said than done as daily temperatures were on the rise and they would have to cross many high confused sand-ridges which run mainly east-west and to a large extent did not hinder the east-to-west explorations 20 years earlier. After two weeks, and more than 200 miles, Wells was concerned about the state of his team and their camels and disappointingly turned back towards his depot without finding water. They had travelled south only a few miles when in the late afternoon birds led them to a depression of limestone outcrops and tall green tea-tree being good food for the camels. He found Aboriginal camp and cooking items which indicated that good water was in the area. On further inspection he found a well filled in with debris and sand. After cleaning out the well the water rose about 3 feet in a few hours. Wells named this Midway Well, as it was about half-way between their

depot and the next known water at Joanna Springs. They then returned to the depot and brought forward the entire expedition to Midway Well.

I navigated into the area of Midway Well using the map, air photo and vehicle odometer, but there was no obvious sign of surface water or a well. The vegetation matched the journal description and Mac confirmed that a depression in the sand was the most likely place to find water. With that we started digging and soon found timbers about 6 feet below the surface and under that what appeared to be a permanent flow of good water. There was evidence of tea-chest wood which was what had been used by the Wells expedition. We used water from the wells for washing as the water we carried was for drinking and cooking. That night was clear and I observed two circum-meridian star altitudes for latitude, although I had no doubt that we were at the right place. Wells used a theodolite and sextant with this method for his latitude and magnetic variation determinations and so it was instructive for our group to see how it was done and Bill was keen for me to use the methods which Wells had used for navigation. The biggest problem was identifying the correct stars from the mass of starlight in the clear crisp desert air. Wells used the large bright primary navigation stars whereas I used the more abundant smaller stars.

Looking for Midway Well – Bill Peasley starting the dig

Midway Well – with timbers and water starting to fill the well

It was winter time and we did not have tents but slept as close as we safely could to the fire, which was always the job of Mac to look after. The fire was for cooking and warmth. I had taken a cold weather sleeping swag from the unit Q Store along with one for Mac and his colleague from Fitzroy Crossing. After Mac had lit the fire he was always the first to place his swag on the sand as he knew which way the wind would blow the smoke that night. The rest of us would either suffer the cold, upwind but away from the fire, or be smoked out downwind during the night. Nights were very cold with frost settling on the swag canvas if you were away from the fire.

From there we headed north across the red sand-ridges for the next two weeks to reach Joanna Springs. The next well was Separation Well, about 30 miles north of Midway Well, found by Wells after following Aboriginal tracks to a spring in soft sandstone and so named as that was where his cousin Charles and Jones separated from the main group, on 11th October 1896, to explore to the west-north-west and then to re-join the main group in the vicinity of Joanna Springs which was the only known waters but 200 miles north. They had taken supplies for about three weeks to reach Joanna Springs by this route. Charles Wells and Jones soon suffered great difficulties with the heat (140 deg F in shade under canvas) and lack of water for themselves and their three camels which were attracted to the green poison bush, and they returned to Separation Well on 21st October, resting there for five days before striking out for the main party on 26th October. By then the main party was 15 days and about 130 miles in front of them also suffering all of the effects of the extreme heat, lack of water, lack of feed for the camels and the harsh terrain of which one of the party counted 65 sand-ridges in 8 miles. Both parties were forced by the extreme heat to travel in the cool of the night but this made it difficult for them to seek the route of least effort through the sand-ridges and they may well have missed water holes. Although we were following the route of the 1896 exploration we were there in the winter and we did not suffer the harsh daytime summer conditions which the explorers had endured.

My navigation method worked well being able to get within 200-400 yards of our targets then relying on the expert advice and desert interpretation skills of Mac who was always able to pick the most likely spot to find water. More than that, on the second day I was amazed when Mac took an air photo from me and deliberately turned it to orient the sand-ridges on the photo to the sand-ridges on the ground and he started to point at features. He had been watching me while sitting next to me in the Landrover as I used the air-photos and stereoscope to navigate, but I have no idea how he knew that the photos were an orthographic view of the ground, what the scale was, or that the many lines on the photos were indeed sand-ridges. Our language commonality was not sufficient for me to quiz him to understand how he did that.

Separation Well provided us with good quality water to fill our drums and it was then 85 miles north to Sahara Well, which Wells found by observing Aboriginals near a soak in soft sand. This well was so aptly named as the sand quickly filled the hole that we dug to find only a slow water flow at about 12 feet. It was then on to Adverse Well a further 45 miles to the north and only 40 miles south of Joanna Springs. Adverse Well was another low flow sand soak shown to Wells by Aboriginals and where he abandoned much of his equipment as the camels were in a terrible state and the loads had to be lightened. The camels were suffering from little food and water and during the day the sand was so hot they declined to lie down to rest.

From Adverse Well we had to head to Kemp Field, an old claypan airstrip, to pick up fuel dumped there by truck from Broome and to pick up our other Aboriginal guide Pukuku (Jimmy) of the Mangala desert tribe. On this deviation I came across some of Len Beadell's (of The Gunbarrel Highway fame and ex-Sergeant Survey Corps) work finding a survey star iron picket marker with a metal tag stamped with his name rather than the organization that he worked for. Len had worked to establish the centre-line track for the Woomera Rocket Range (Blue Streak rocket) which went from Woomera north-west all the way to Talgarno near Broome.

Sahara Well – another 6 feet to go

The vehicles were very slow across the high sand-ridges, especially Bill's old Landrover, and most days I walked with Mac many miles in front of the vehicles navigating by map, air photo, magnetic compass and pacing. To indicate our position and the best site to cross the sand ridges we lit small fires of spinifex (known as porcupine grass in 1896) grass which burned with thick black smoke. The diesel Landrover was by far the best desert vehicle and flew over the sand-ridges sometimes having to tow Bill's vehicle. On the worst travel day we traversed only 8 miles over the sand-ridges. This compared with an average of about 30 miles and 20 miles for the camel expedition. The sand on the ridges was very soft and the vehicle front tyre pressures were reduced to 15lb/sqin and the rear tyres to 18lb/sqin - then the tyres were inflated between the dunes or risk more staked tyres than normal. The spinifex shredded my GP boots with the spikes going straight through the leather after a couple of weeks – just as well I had taken a spare pair. Mac told me of the fire stick farming used to encourage new growth which would then attract kangaroos etc. for hunting. At times I had to stop him from lighting a fire which might have burnt out the main group behind us. Some fire scars evident on the air photos showed that spinifex fires went for up to 30 miles obviously with a strong westerly wind.

Shoots of new green spinifex after fire and rain

Hard work getting Bill's heavily laden Landrover over the sand-ridges

One night, about three weeks into the trip, one of group said to me that he envied surveyors as they always knew where they were and how to get where they wanted to go. He asked how would they get out of the desert if something happened to me ? I said that there was the radio, the two Aboriginals and just turn left (west) and follow the sand-ridges to the main road which was about 250 miles away. He was happy with that.

The evening routine was to repair the day's flat tyres, normally about four caused by fire-hardened stakes in the side of the tyres, have dinner, read to the party Wells' journal for that part of the exploration, write up the journal, then Bill and I would plan for the next day after which I worked on my navigation plan. One of my tasks was to estimate fuel requirements for

our next resupply – the petrol vehicles used more fuel (average 2 miles per gallon) than we had anticipated, mainly because of the high revving to traverse the sand ridges which were 30-50 feet high. One night Bill arranged for us all to phone home through the HF radio link to Meekatharra RFDS base who patched us through to the Telecom switch for the standard three minute call – a much appreciated morale booster for us all.

Jimmy did not fancy our standard lunch of dry biscuits and tinned cheese washed down with a cup of tea, preferring to find himself some fresh meat 'fast food'. After a couple of days of this I asked him if I could join him in the hunt and within a hundred metres he found a spot to dig with his hands, near a tree, and pulled out a small goanna by the tail. He quickly thumped it on the ground to stun it, bit its four legs so that it could not scratch him, then squeezed it backwards at the base of the sternum to kill it and such that the guts came flying out. Then back to the lunch fire where he threw it on the edge of the coals with a satisfied smile on his face. The tail meat was very good.

Jimmy and one of his lunchtime 'fast food' goannas

We returned to following the 1896 exploration to find Discovery Well so named by Wells in April 1897 on his third search expedition looking for his missing explorers, when he found some of their equipment near this Aboriginal water. It was on this third search expedition that Wells finally found, with the aid of Aboriginals, what he believed to be the elusive Joanna Springs and observed its astronomical latitude and longitude. He found that Warburton's latitude was satisfactory but that his longitude placed the springs about 15 miles to the west. On not being able to find the head of the Oakover River, Warburton realized that he had a longitude error and said himself 'either we suppose ourselves more to the westward than we are, or else the head of the Oakover is laid down more to the eastward than it is. The error is probably mine, as it is difficult to keep longitude correct after

travelling many months on a generally westerly course.' For longitude, Warburton used lunar distances observed by sextant, along with timed star altitude meridian crossings and dead-reckoning from his last astronomical fixes when the sky was clouded. Unfortunately for Warburton, this area was clouded for more than ten days and to a large extent he had to rely on dead reckoning.

From Discovery Well we travelled about 18 miles to within a mile of Wells' Joanna Springs when Jimmy stopped us to say that we first had to walk-in, in single file, trailing a piece of scrub to sweep away our prints in the sand. Evil spirits could not then follow us. We navigated directly to the springs which matched the description of both Warburton and Wells. I made a positive identification of the springs on the air-photo and transferred it to the map showing that the position was a further four miles to the east than what Wells had observed. Late afternoon large flocks of budgerigars swooped in for their evening drink with colourful wing flashes as they turned rapidly as one. After a comprehensive search as far as 30 miles west, and with Jimmy not knowing of any other similar spring in the area, our 1980 expedition confirmed with certainty that there was no water or spring at Warburton's reported position for his Joanna Springs and that there was no doubt that we were at Warburton's and Wells' Joanna Springs. Warburton's longitude was a significant error, but in all the circumstances of his condition at the time it could not be reasonably found to be the fault of Warburton.

The locality of Joanna Springs

Joanna (Biggarong/Pikurangu) Springs - Jimmy, Peter Jensen, Mac

The Warburton reported location of Joanna Springs was where the two parties were to meet and where Wells waited for his other party. He arrived there on 29th October with only the barest of water for his party and his camels. There were no smoke signals as expected from his cousin and no tracks in the sand. He searched in vain for the springs, nearly dying himself from lack of water on a day when he walked 20 miles, and found no evidence of water, especially noting the absence of birds in the early mornings and evenings. At that point he hoped that his cousin had headed out of the desert to the Oakover River about 180 miles to the west. Lawrence Wells' party was in a perilous state, and reluctantly on 31st October 1896, and after discussing the options with his colleagues, all suffering terribly from the heat, lack of water and dying camels, much as Warburton had done at the same time of year in 1873, he had no choice but to head for Fitzroy River to save their lives. By then they had abandoned all but the most life sustaining items. Warburton's group of seven explorers had suffered a similar predicament surviving the Great Sandy Desert with only their lives, all suffering from scurvy, and only two camels of the seventeen they started with, with Warburton himself arriving at the Oakover River, strapped to a camel in the prone position and almost blind. Wells, his four comrades and 12 camels (only two able to carry a load) reached Fitzroy River on 6th November 1896. Somehow he travelled the last 140 miles without finding water for the camels of which five died. He then immediately mounted and led four expeditions in search of his lost colleagues. The Western Australian Government also mounted search and rescue parties into the desert.

It was not until his fourth search expedition, and with the aid of Aboriginals, that Wells found the bodies of his two explorer companions on 27th May 1897 about 6 miles north-east of Discovery Well and only 4 miles from the Warburton reported position of Joanna Springs. Wells estimated that both men had perished about mid-November 1896. Beside the body of the 18 year old George Jones was a loving farewell letter (undated) to his mother and father explaining that their camels had gone or died, that they had struggled to walk half a mile a day, that there was no sign of water of which they had only a half-gallon remaining and that no one was to blame for their terrible predicament.

The bodies of Charles Wells and George Jones were taken by ship to Adelaide and lay in state in the Exhibition Buildings, as much an honour as had been given to Burke and Wills in Melbourne 35 years earlier. Thousands of people attended the funeral to honour the two explorers as they were laid side-by-side in the North Road Cemetery with the simple epitaph on the tombstone – 'Together'.

At that time the area traversed by the explorers supported several hundred Aboriginal people living there and travelling from water to water. After his journey Wells wrote: 'In 100 years' time I think this desert will be as unoccupied as when I crossed in 1896'. In 1980 it was devoid of any human beings living there permanently.

After the loss of the two explorers there was much speculation about the soundness of decisions made by Lawrence Wells. The Royal Geographical Society considered all aspects of the planning, preparation and conduct of the expedition and found that in no way was Lawrence Wells responsible for the deaths of his colleagues. Indeed, the Society commended him on his perseverance, courage and heroic attempts, made at great peril and risk to himself and others, to find and rescue his lost comrades alive.

In a tribute to Wells and his explorers, the President of the Royal Geographical Society said in 1897, 'Since reading Nansen's book I have asked myself if the cold and darkness of the long Arctic winter equalled in horror the burning heat and thirst of our Australian summer and desert. It will always be a question…….'

Lawrence Wells went on to senior positions in the South Australian Government primarily in survey and land related appointments and led expeditions into desert areas until he was 73 years of age. He was well known for treating the Aboriginals with dignity. He died in 1938, aged 78 years, after being hit by a train near Blackwood Railway Station, Adelaide. For his life's work he was awarded the Jubilee Medal and made a member of the Order of the British Empire.

From Joanna Springs we headed west-north-west out of the desert following the sand-ridges to a track then onto the Great Northern Road, at the Sandfire Roadhouse, on 19th August. We had been in the desert for about a month, in relative comfort, having achieved the aim of the expedition and having gained a tremendous respect for the explorers of more than 80 years ago who suffered the worst privations possible in what must have been some of the harshest and most unforgiving environmental and terrain conditions to be experienced anywhere on earth. I will forever be amazed at how many-many generations of Aboriginals survived those extreme conditions of which we gained only a very small insight.

It took a few days to drive back to Perth, after returning Jimmy to Lagrange and Mac to Jigalong, passing seas of desert wildflowers of pink, white and lemon emerging around Cue at the beginning of spring. On telling Jenny about the flowers she convinced me to return to that desert fringe – in our Datsun 180B - for a long weekend shortly after. By then the wildflowers were in full bloom with not much red sand visible. The SQMS was not too happy about the fine red sand ingrained in the sleeping swags but Jim Corless was pleased that he could report to the District Commander that the Survey Corps' reputation of not getting lost was intact. A couple of weeks later a story of the 1896 and 1980 expeditions featured in The West Australian Sunday Magazine.

Recollections ...a (J)GEM of a Fleet

The following article on the use of the Johnson Ground Elevation Meter by RASvy and Natmap in Australia was researched and produced by Paul Wise (ex Natmap). Paul has kindly provided permission to publish the story in our Association newsletter.

(Johnson) Ground Elevation Meters (L-R) : National Mapping, Royal Australian Survey Corps, United States Geological Survey (missing is a photo of the Canadian vehicle)

Ground Elevation Meters (GEM) were mainly operated by Australian and North American mapping agencies in the 1960s and early 70s. In Australia they were called Johnson Ground Elevation Meters (JGEM) after one of the patent holders and apart from being modified for Australian right-hand drive and 240 volt power to the pendulum heater, all vehicles had exactly the same capability. Bob Barrett (USGS) recalls that when the American manufacturer Sperry Sun stopped making them, "we bought all their parts, (pendulums, etc.) and one was built in Rolla [Missouri] - this one was state-of-the-art, with a Northstar computer".

The (J)GEM became available about 1961 and was demonstrated, in the USA, to National Mapping and RA Survey in 1963. Each agency ordered one at some $80,000 apiece and the vehicles arrived in Australia in 1964.

The (Johnson) Ground Elevation Meter was a modified General Motors Corporation (GMC), four-wheel drive vehicle. In addition to automatic tyre pressure monitoring, four wheel steering, and airconditioning (for the on-board electronic equipment and not the crew) it had a special, smaller 'fifth' road wheel. Further, a 'bar' between the front and rear axles had an electronic pendulum attached. The 'fifth' wheel accurately measured the distance travelled during operations by generating signals at a frequency proportional to the speed. Simultaneously, the longitudinal angle of the vehicle was continuously measured by the pendulum generating a current proportional to the sine of the angle of tilt. The on-board computer combined the two measurements and provided the height variation at any point in the run on a paper printout.

Operationally, the height difference between a bench mark and the 'fifth' wheel was taken with a level and staff. The vehicle was carefully driven to the next point where the height difference from the computer was noted. Then the level and staff were again used to measure the height difference between the 'fifth' wheel and the bench mark. Mathematically applying these three height differences provided the height of the second bench mark or a check on the original levelling.

Sperry-Sun Rand the manufacturers, claimed fourth-order levelling standard, 24/7 in all weather. However, these claims could not be met under Australian conditions largely due to the quality of the then road surfaces - the 'fifth' wheel required a relatively smooth surface to maintain accuracy. Nevertheless, National Mapping did obtain results with an error of less than 10 feet (3m) in 50 miles (80km) at 15 miles an hour (25kph) on reasonably good road surfaces, averaging 100 miles (160km)/day. Overall, around 5% of all National Mapping vertical control was obtained using the Johnson Ground Elevation Meter. In flat country, where the sealed road system was reasonably extensive, the Elevation Meter demonstrated that a network of heights could be obtained which would allow contouring for 1:100,000 scale mapping.

The USGS have kindly allowed the reproduction of their 'Topographic Instructions of the United States Geological Survey, Supplemental Control Elevations by Elevation Meter, Book 2. Chapter 2F4, 1970' which provides greater technical and operational detail. As far as it is known Australian operations proceeded along similar lines.

From Annual Reports, Natmap's JGEM operated in NSW and Queensland. John Hook, who operated RASurvey's equipment, recalled his areas of operation in NSW and Victoria and prior work, by the Corps, in Queensland (refer Figure 1).

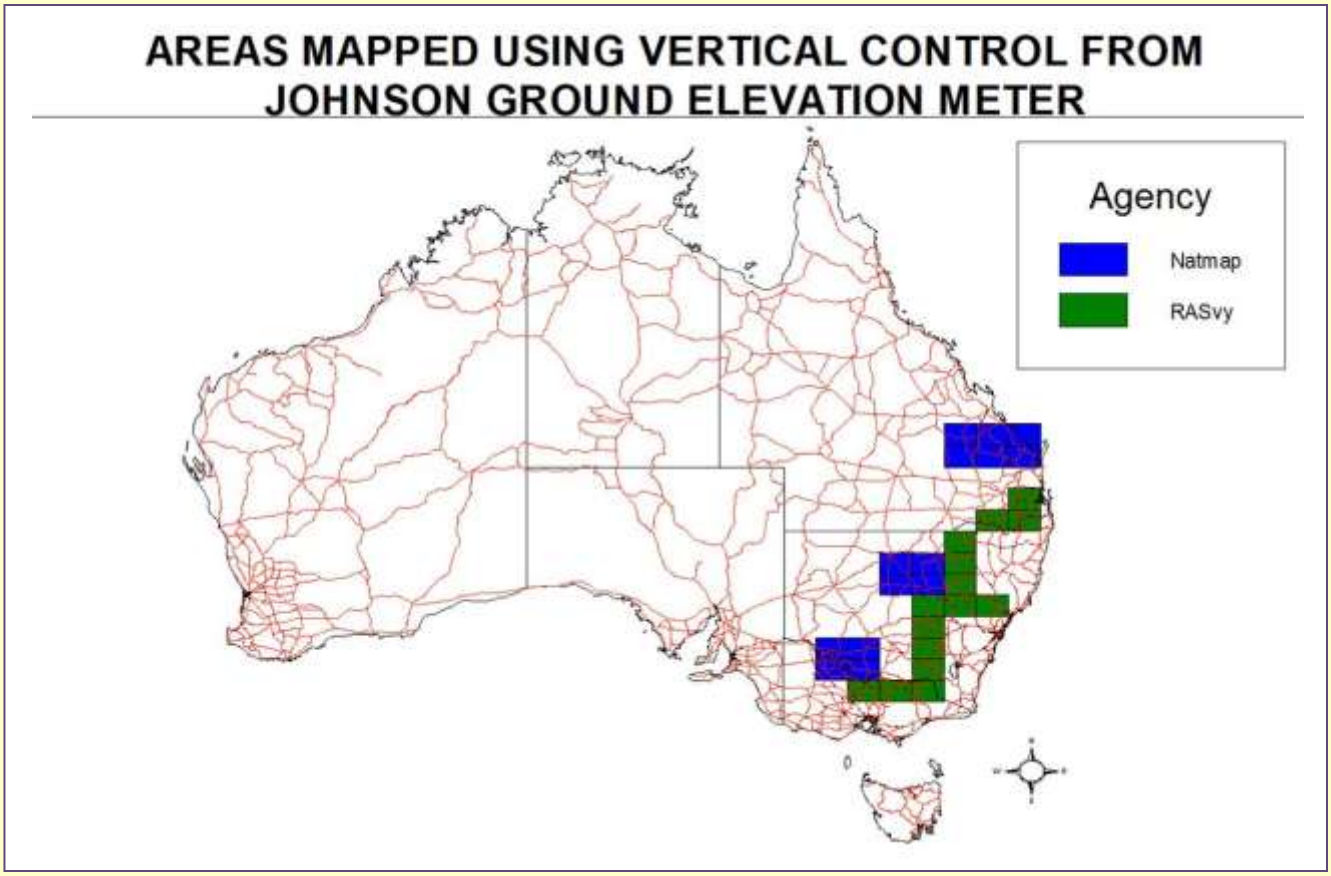


Figure 1: Johnson Ground Elevation meter areas of operation in Australia

Laurie McLean recalls that in 1970 he drove the Bedford carrying Natmap's unserviceable JGEM from Broken Hill to Melbourne. It is believed that this equipment was never operated again by Natmap.

RA Survey's John Hook recalls that "in 1969 the boss said to me – here is the JGEM and here is the manual. Nobody knows anything about it. Go and learn! I drove it for the next 3 years. Each 1:250,000 scale map required 36 points (9 runs of photography and 4 points across [RA Survey used an analytical block adjustment technique]), and I can remember the 6 x 1:250,000 scale map areas that I did (refer Figure 1). I don't think it was used much after that. They got me back to the Survey School [then Bonegilla] in about 1985 to run a course on the GEM but I don't know if they did any production work after that".

It is believed that RA Survey's JGEM is now the only one of the fleet in existence. Housed at the Museum of Military Engineering at Moorebank NSW it is undergoing refurbishment (see photographs below).

United States Geological Survey GEMs – note left-hand drive

Natmap's GEM with Norm Hawker

RASvy's GEM with John Hook

Natmap's GEM with Norm Hawker

RASvy's GEM with SPR Bob McDonough and John Hook

Levelling to get elevation of 'fifth" wheel

Natmap's JGEM in four wheel steer (only known colour photo) RASvy's SPR Lyn Thompson & CPL John Hook

Natmap's JGEM interior

RASvy's JGEM interior

Natmap's JGEM with Norm Hawker operating

RASvy's JGEM showing computer and readout

RASvy's JGEM showing 5th wheel monitoring and air conditioning (under dash)

RASvy's JGEM showing auto inflation control panel

RASvy's JGEM showing 5th wheel retracted

RASvy's JGEM showing tyre auto inflation fittings

Cuttings from local newspapers re RASvy's JGEM operating in NSW (courtesy John Hook)

Army survey unit obtains map data

A follow up survey in connection with the compilation of maps of the Coonabarabran-Coonamble-Coolah and Gilgandra areas is currently being carried out by a mobile unit from the N.S.W. Army Department, operated by Corporal John Hook and Sapper Lyn Thompson.

These two young men arrived in Coonabarabran about a week ago in their fully equipped Army vehicle which is of special interest as there are only two of its type in Australia.

Explaining the procedure of map compilation, Corporal Hook advised that there were several stages involved before the final prints were made.

Some time ago aerial photographs of the Coonabarabran - Coonamble-Coolah - Gilgandra areas were obtained.

Ten Army surveyors arrived about one month ago to complete a survey based on horizontal control and this is now being followed by a vertical control survey.

Corporal Hook reported that the Royal Australian Survey Corps was responsible for the compilation of maps and each state of Australia, with the exception of the Northern Territory, had its own unit of surveyors and assistants for this work.

Referring to existing maps of the Coonabarabran - Gilgandra area, Corporal Hook said these were compiled on a one for 250,000 basis, while the scale for the new series would be 1:100,000.

"Most of Australia has been covered by 1:250,000 maps," said Corporal Hook, who added that the department was now planning to complete a series of 1:100,000 maps.

CAREER

When asked what opportunities this section of the Army Department offered to young, career minded men, Corporal Hook said the topographical surveyors' training course was extremely interesting and the normal duration of six years was often reduced according to the ability of students.

He added that the boredom of continuous study was avoided as there were alternating periods of control work out in the field followed by office work which covered the drawing of maps and the operation of computers and plotters.

When asked if these maps which the department compiled, were available to the public, Corporal Hook said they could usually be obtained from the Department of Lands or direct from the Army Department if necessary.

The elevation meter was brought to the Times office for inspection and Corporal Hook explained the method of operation.

A 200c wheel near the base of the meter's post is lowered for the measuring of distance on roadways and an electronic pendulum measures the angle of inclination.

These two combined give the difference in height.

Asked to comment on their impressions of Coonabarabran, Corporal Hook and Sapper Thomson advised that it was one of the friendliest towns they had visited.

New map of Temora is being prepared

After 30 years or so the Temora district is being re-mapped.

An $80,000 aerial survey vehicle is in the area laying the foundations for the programme.

The unit — crammed with electronic gear — is being [illegible] throughout the district. These will be used in conjunction with recent aerial survey photographs to draw the new maps.

The survey team, Cpl. John Hook and Sapper Bob McDonagh, have been working out of Temora for the past two weeks.

They are finding spot heights in an area ranging from Cootamundra and Barmedman down to about 20 miles the other side of West Wyalong.

This area — some 120 miles across — was covered by plan "nets" in a recent aerial mapping survey.

The ground team are now finding the exact height of 30 points in the area. These are easily recognisable features, such as bridges, road junctions, or fence corners, which can be picked out on the aerial photo mosaic which will be made from the aerial survey pictures.

Once the height of these chosen spots is known, the mapping draughtsmen can accurately draw in the height of other features from their stereoscopic photographs.

The survey van is one of only two of its kind in Australia.

It contains an electronic computer which, by measuring the distance and angle at which the van moves, will automatically give the height it has climbed or fallen from a pre-determined spot.

SPECIAL HOSES

It's four wheels have special air hoses running to the hub of each wheel, so that constant tyre pressure are maintained and the compactor will not be thrown out by a partially deflated tyre.

As well the two rear wheels "steer" around corners, so that they follow the front wheels exactly.

A fifth wheel under the van is lowered to give exact readings of distance.

The team works from known heights which have been established along the railway line, or survey "bench marks" throughout the district.

It is a tribute to the accuracy of the early railway engineers that their surveys, made last century, are still considered to be so reliable.

Once the team has found a known height their computer is set to correspond with it. They then drive to a spot — perhaps a fence intersection — that will be easily recognised on the air photographs.

Upon their arrival the height of the "unit" is read off from the computer, which has measured it by the distance and angle at which the van has travelled.

The heights are accurate to less than a metre.

The survey is in preparation for part of the new 1:250,000 National Survey which is being undertaken to provide comprehensive maps of Australia.

The maps are measured in metres, as this is now the pattern throughout the world.

Australia will eventually change over to decimal measurement, as it has changed to decimal currency.

OUTDATED

The need for the new maps is shown by the fact that the present ordinance map of the Temora area is almost unobtainable.

The original maps — like those of the Wagga area — were made from a pre-war survey.

Since then much of the district has been cleared, new roads have been built, while Wagga and Temora have extended over areas the maps show as farm or scrubland.

The Wagga map, reprinted a couple of years ago but using a pre-war survey makes out all the city's new suburbs.

The only district maps which could be found by Temora this week belong to the N.S.W.C.C. and these were produced hurriedly with a minimum of detail in 1942.

PICTURE:- Cpl. Hook checks the "fifth wheel" of his van after measuring the distance from a marker. The angled rear wheels and the way they follow exactly over the tracks of the front wheels can be seen. Below, Sapper McDonagh reads of the height at which the van is now standing and the distance covered from the compactor display.

ARMY SURVEY UNIT IN GILGANDRA

A follow up survey, in connection with the compiling of a map of the Gilgandra area is currently being carried out by a mobile unit from the NSW Army Department, operated by Corporal John Hook and Sapper Lyn Thompson.

These two young men arrived in Gilgandra yesterday in their fully equipped Army vehicle which is of special interest as there are only two of its type in Australia.

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Contributors

Recent interest in the (J)GEM was sparked by inquiries from Mike Cecil, former Head of Military Technology at the Australian War Memorial, now retired and living in the United States. Mike brought together information from both North America and Australia, and has submitted an article about the (J)GEM for publication in Army Motors: the Journal of the Military Vehicle Preservation Association. Once published, a copy will be added to the webpage at http://xnatmap.org/adnm/docs/recolls/recolgem.htm .

Technical and historical information used for both his article and this page has been kindly provided by:

Paul Wise	*ex-National Mapping*
Laurie McLean	*ex-National Mapping*
Bob Skitch	*ex-Royal Australian Survey Corps*
John Hook	*ex-Royal Australian Survey Corps*
Patrice Lascelles	*Natural Resources, Canada*
Keith Brady	*USGS, Office of Communications and Publishing*
Bob Barrett	*ex-United States Geological Survey*
Paul Martyn-Jones	*RAEME Association NSW Inc.*

AUSTRALIAN ARMY

MUSEUM OF MILITARY ENGINEERING

The Military Engineering Heritage Company

Steele Barracks, Moorebank Avenue, Moorebank NSW 2170
Phone (02) 8782 4443 or 8782 4385, Fax (02) 8782 4799
ABN: 43 096 343 869

"Does this measure up?"

Ground Elevation Meter (G.E.M.)

The GEM is built up on an USA GMC 305 Cubic inch (5 Ltr) V6 'Suburban' light truck of 1964 vintage. The unit was operated by the Survey Corps and part of its uniqueness is that as well as being 4 wheel drive it was also 4 wheel steer. This was accomplished by replacing the rear axle with a second front axle and connecting the steering mechanisms together. The tyre pressure was maintained constant from inside the vehicle on both the drive wheels and the small distance measuring '5th' wheel located under the drivers door. Note the air conditioning unit under the dash.

The unit was designed to measure elevation from a known point. It did the work of basic surveying with level and staff but with the advantage of being able to traverse and record up to 100 miles (160km) per day. The basic 'computer' on board recorded distance and inclination which was printed out on paper tape which the map makers could use along with aerial images to manufacture very accurate maps. Below shows the inside of the GEM with its electronic equipment and 'computer'.

(If you have or know anybody with images of this little GEM in service can we please obtain a copy!)

Thanks to our MLO (Phil Hurren) for submitting the information and images for this newsletter.

"Preservation of our heritage" *010 Survey vehicle - GEM 230807*
Photos of refurbished JGEM at Moorebank

Menzies, R.W. & Wise, P.J. (2011) The 1:100,000 Scale Topographic Mapping Program - Assisted by Technology, 100 Years of National Topographic Mapping Conference, Canberra 2011, Paper 7 from CD-ROM.

Vale

PHILLIP DAVID BOYLE

Photo from Phil Bray

313933 Phillip David Boyle (Phil) passed away on 15 January from a subdural haematoma. He served for a little over 25 years in the Corps (Feb 70 – Jun 95). Phil was farewelled on Friday 1st Feb at Norwood Park Crematorium, Canberra.

Below: On the 1/84 Sub 4 for WO

JOHN AUSTIN YARRA

By Charlie Watson

VX100897 John (Jack) Austin Yarra who was the last WW2 member of our Canberra Survey Corps Association passed away on 2 Nov 12. John worked at NATMAP after the war and rose to the level of Chief Cartographer. John was an expert with the air brush for depicting hill shading. The 1:5m map of Australia (hill shaded) was one of his fine achievements.
Many of us will remember John riding his motorised scooter in the Canberra Anzac Day parades in recent years. John (often called Jack) was born at East Malvern, Victoria, on 1 October 1922. In his youth he was a keen member of the Elwood life saving club. After high school he went to study Graphic Arts at Caulfield Technical College.

John enlisted in the Citizens Military Force in September 1941, at the 3rd Military District, Royal Park, Victoria. He was then posted to the Land Headquarters Cartographic Company. The Company was still accommodated in Latrobe and Swanson Streets Melbourne at that time but had moved to Bendigo by June 1942. John transferred to the 2nd Australian Imperial Force in September 1942. His Regimental Number was VX100897. He was then posted to1st Australian Mobile Lithographic Unit, which was stationed in Northern Australia. John was posted to 2/1st Field Survey Company in1943. The unit was later renamed the 2/1st Australian Army Topographic Survey Company. He served with that Company in the South West Pacific Area of operations from 1943 to 1945,in New Guinea, Dutch New Guinea, Morotai, and the Halmahera Group of Islands. At the conclusion of World War Two John returned to Australia in November 1945. John was then posted to the Land Headquarters Cartographic Company at Bendigo to accumulate discharge points and await discharge. John was discharged from the Australian Imperial Force in April 1947. While serving in the Army John was employed in several trades, Photogrammetrist, Topographic Draftsman, Field Survey Assistant (as required) as reached the rank of Sergeant by the time of his discharge.

While stationed in Bendigo John met and Married his wife Ruthe who was a nurse at the time. Ruthe was originally from the Gippsland District. John and Ruthe had four children, Lee David, Jane and Kim.

After discharge from the Army John Moved to Canberra and took up a Job with what eventually became NATMAP, as a cartographic draftsman. When John retired from NATMAP in 1981 he held the position of Assistant Chief Cartographer, Thematic Mapping Branch. In the intervening years he had worked on many different types of mapping. The main areas were the National Map Series at 1:100,000 and 1:250,000, the 1: 1 Million International Map of the World, The Atlas of Australian Resources and many thematic maps. John was very skilled at the use of the air brush to depict terrain. His skill is evident in the NATMAP map of the Australian Land and Seabed Relief Map which he drew. This map received excellence awards in the General Purpose Cartography and Open Section at the International Cartographic Association Conference in Perth in 1984.

John's hobbies were woodwork, photography, calligraphy and sailing. He owned six yachts, many were built by John. He was President of the Canberra Yacht Club for a number of years. John did a number of calligraphy commissions in his retirement years. His work was of utmost quality as evidenced by the many drafts discarded as not good enough.

Ruthie died in 1997. John had a stroke in 2002. However, by sheer determination he was able to recover and live an active life with the assistance of a carer in the later years.

Brief Record of Service:

Enlisted CMF Sept 1941, 3MD Royal Park, Vic, served with LHQ Carto Coy.
Transferred to AIF Sept 1942, served with 1 Aust Mob Litho Unit, Northern Australia.
Transferred to 2/1 Fd Svy Coy RAE, AIF 1943, later renamed, 2/1 Aust Army Topo Svy Coy, served
SWPA 1943-1945, New Guinea, Dutch New Guinea, Morotai, Halmahera Gp.
Returned to Australia November 1945.
Deployed to LHQ Carto to accumulate discharge points and await discharge.
Discharged from AIF April 1947.

Trade, Photogrammetrist, Topographic Draftsman, Field Survey Assistant (as required)
Rank on discharge, Sergeant.

JOHN RUPERT CATTELL

From the SA Newsletter

53366 John Rupert Cattell (pictured in June 2010) died in Queensland on Sunday 24 February 2013 after a long illness. John joined the Corps in Mar 1958, and after completing his Basic Course was posted to the Regiment. He was selected for officer training at OCS Portsea graduating in June 1960. Following a period of civil schooling he served in various appointments in South Australia and in Canberra. In 1966 he was engaged in Aerodist operations along the Sepik Valley and the north coast of PNG. He was the Australian exchange officer with Canada in 1969 -71 and subsequently was appointed OC Air Survey Squadron at Bendigo where he served for several years. From there he was posted as OC 5 Field Survey Squadron at Karrakatta before retiring in Dec 1978 to work on mapping in Tasmania. John is survived by his wife, Sally