Canberra Survey Corps Association

Canberra Newsletter

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From the Editor/President

Welcome to issue No 60 (November 2022) of the Canberra Survey Corps Association newsletter. This Remembrance Day issue is the last newsletter for the year so I take the opportunity on behalf of the Association to wish everyone a Merry Christmas and Happy New Year. Next year I plan on publishing three newsletters to coincide with reports on Anzac Day, the Corps Birthday and Remembrance Day. As always I ask for your stories and articles to keep the newsletter going.

For this issue I especially thank Peter Demaine, Norm McMurtrie, Don Swiney and Charlie Watson for their articles.

Please don't forget our Christmas Drinks at the Duxton Bar and Restaurant at the O'Connor Shops on Thursday 8th December at 5.00pm. No RSVP needed, just come along. We will be as COVID safe as practical, sitting outside weather permitting.

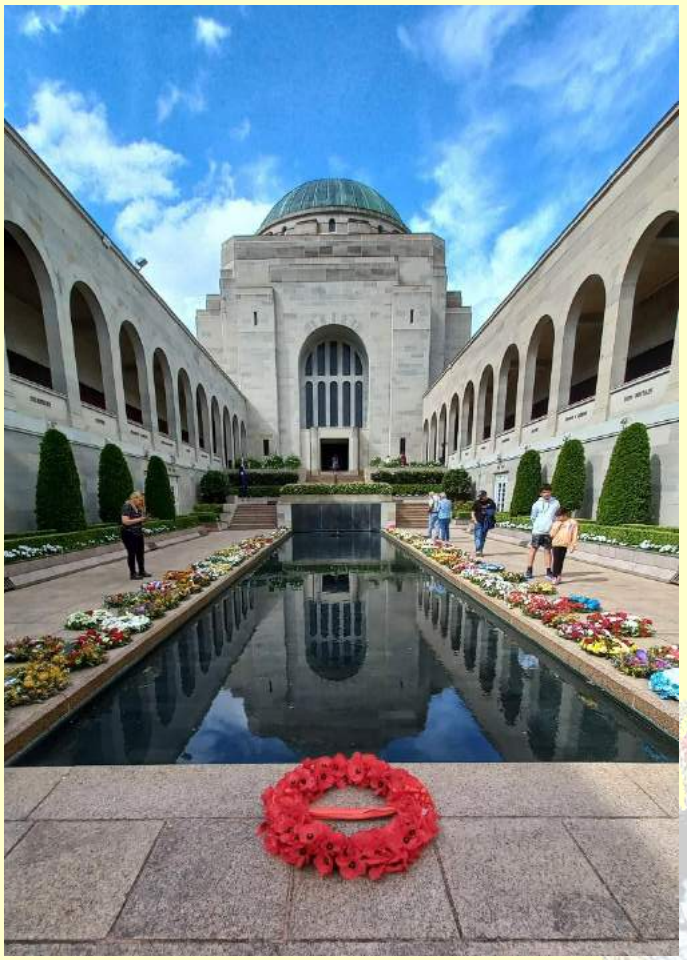
Seasons Greetings

Peter Jensen

Editor/President canberrasvycorpsassoc.pres@gmail.com

Remembrance Day 2022

By: Peter Jensen



The Remembrance Day 2022 National Ceremony at the Australian War Memorial centred around the Stone of Remembrance temporarily located in the western Sculpture Garden during the redevelopment construction of the memorial. This restricts the ceremonial format with no room for an honour guard. The catafalque party mounted around the Stone of Remembrance was from Australia's Federation Guard (Canberra) and the band from the Royal Military College, Duntroon. His Excellency General The Honourable David Hurley AC DSC (Retd) was the senior official guest, laying the wreath of remembrance of red poppies (left) on behalf of the people of Australia. After the ceremony the official wreaths with many from the national embassies in Canberra were moved from the Stone of Remembrance to the surrounds of Pool of Reflection inside the memorial.

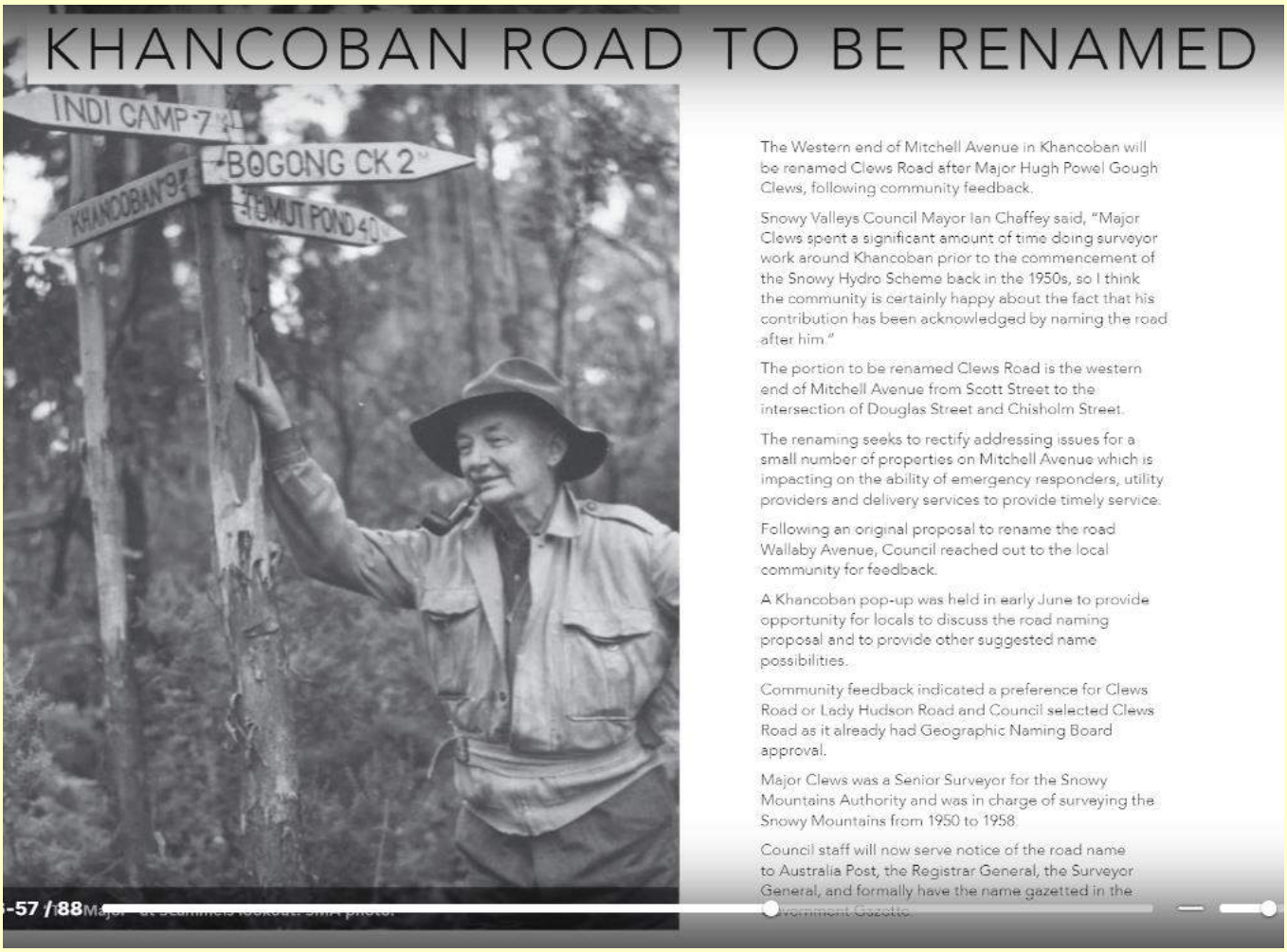
Members of our Association gathered for lunch at the Kingston Hotel. After our short annual meeting thanking Secretary Charlie for organising our three lunches through the year, we offered the traditional toast of 'honouring the memory of those who died, those who served and absent friends'. From the left in the photo: Effie Rees, Dave Miles, Ross Jenkins, Peter Jensen, Roger Rees, Len Kemp, Dawn Laing and Charlie Watson. A late apology was received from Peter and Robyn McCurdy.

I believe that the bugler (left) playing the Last Post and the Rouse at the Aust War Memorial National Ceremony was Sergeant Duquemin, Aust Army Band Corps, the son of the late Warrant Officer Class 1 Dennis Duquemin, RA Svy, who served as a topographic surveyor in the Corps 1962 - 1986. Dennis served with Detachment 1 Topographic Survey Troop in Vietnam in the first rotation May 66 - Jun 67. Dennis began his Army service as an Apprentice Musician at Army Apprentice School, Balcombe, which was then also the home of School of Military Survey.

Clews Road – Khancoban NSW

By: Editor from information provided by Peter Demaine

Thank you to Peter Demaine for spotting this article in the magazine *Snowpost* https://monaropost.com.au/snowpost/86/contents about the renaming of a road in Khancoban NSW to be Clews Road, named of course after the legendary Lieutenant-Colonel HPG Clews, RA Svy and Snowy Mountains Authority, and a founding member of the Australian Survey Corps (Permanent) on 1 July 1915, having served with the Survey Section RAE (Permanent) since 1912.



FTER SNOWY MOUNTAINS SURVEYOR SH

Major Hugh Powell Gough Clews

Major Hugh Powell Gough Clews (1890-1980), surveyor and army officer, was born on December 25, 1890 at Rotherham, Yorkshire, England, son of William Henry Clews and Helen Powell. At age

Major Clews was offered a five-year contract as senior surveyor with the Snowy Mountains Hydro-electric Authority, made by his old army colleague Bert Eggeling, the Authority's chief surveyor. Major Clews would stay to complete his investigatory work until retirement in 1958.

His courage, humanity, charm and leadership made him a man among men and a legend of the Snowy Scheme.

Timeline

1911 Major Hugh Clews left the British Army and migrated to Australia

Clews joined the permanent military forces as a sergeant in the survey section of the Royal Australian Engineers. He was employed as a mapmaker in South Australia

1912

1918 Married Alice May Reeves in Melbourne. They had one son and two daughters

The Major worked with the Australian Survey Company, surveying many different locations
1919 throughout Australia, including Strathfield, Katoomba, Newnes Junction, Wollemi, Newcastle, Kyogle, Childers, Ingham, Fraser Island, Chatswood and Kosciuszko

1949 On 29 July he was placed on the retired list as

Clews entered into a five-year contract as a senior surveyor with the Snowy Mountains Hydro-electric Authority. Major Clews was one of the few experienced surveyors in Australia at the time. 'Clewsie' established his first camp at Dry Dam, near Cabramurra. He had 50 men with him, working in groups of six

1950

1958 Retired to a 40-acre (16 hectare) lease at Indi, near Khancoban, where he built a pisé house

History

'Clewsie' - the character, the bushman, the legend

He loved to be the first into new territory. His legendary reconnaissance surveys, carried out on-foot across harsh terrain preceded the construction of roads and tunnels, for the mighty Snowy Scheme.

For eight years his strength of character, endurance and remarkable bushmanship often found him miles away from anywhere, but led him and his team to survey Guthega, Geehi, Lobs Hole, Dry Dam, Kings Cross, Kennys Knob, Three Mile, Tumut Pond, Indi, Scammels Spur and Cowombat Flat.

There was no ceremony or fuss with 'Clewsie', often spreading his survey charts across the ground when out in the field, weighted by small stones.

The Major had an effortless way of bringing people with him, he was clear-sighted, competent and loyal. He won the admiration of the Scheme's migrant workers, direct colleagues and many others. A true legend in his own time.

The Major was a practical man, so while on reconnaissance surveys, he often delivered maps and precious mail for the men simultaneously. He kept his cargo safe in a rubber pouch wrapped high around his bare chest.

The picture of the man

By all accounts Major Hugh Powell Gough Clews standing at 168cm (5 feet 6 1/4 inches), was a wiry, white-haired fellow, sporting a well-worn, battered army (mountie) hat and a pipe. He wore his shirt tucked into baggy serge trousers with a simple, hand-made leather belt. The legs were tucked into thick woollen socks that bulged above heavy rubber-soled army General Purpose (GP) boots.

The Major disliked riding horses, so he walked. He would pack a small rucksack for his three or four-day excursions, with his bedding, billycan, mug, tea, sugar, dry bread, slab of cheese, butter, matches, pipe, tobacco and a flask of his favourite rum, Lowndes.

Major Clews hut and a granite cairn found at Indi stands today commemorating his work and legend.

For more information and stories about The Major, visit Snowy's online store
visit us at: snowyhydro.com.au

issuu

The timeline in the article is a little scant on detail about 'the Major's' Army service which made him a Corps legend. In the National Bulletin of Survey Corps Associations, No 16, November 1980, Clem Sargent wrote tributes to 'the Major' who passed away not long before that, and an article about the Survey of the Snowy. An article on the life and times of HPG Clews (1890-1980) was also published in the Survey Ex-Servicemen's Association of NSW Bulletin No.81, January 1995 Special Edition. For those of you not familiar with 'the Major's' story of long and outstanding service to his country, the following is drawn from those articles.

HPG Clews was born on Christmas Day 1890 in England at Rotherham. At age 18, he completed two years of articles to a surveyor, but was not too impressed about the range of minor work that he had been involved in. Mostly about buildings and roads and only basic surveys at best. He wanted to enlist in the Royal Engineers (Survey) but was too short in

height. He was however accepted into the Nottingham and Derbyshire Regiment – the Sherwood Foresters. He later became an Army school master and later transferred to the Army Service Corps as a clerk but sought his discharge not long after. He then decided to emigrate to Australia where Western Australia looked to him to have the best opportunities. He landed in Fremantle in December 1910 and soon had a job in a bush clearing gang near Kellerberrin. There he saw in a newspaper a recruiting advertisement for men with military and survey experience. He applied, and being successful he was enlisted in Adelaide on 1 Aug 1912 as a Sergeant Topographer in the new Survey Section Royal Australian Engineers (RAE) (Permanent Forces). For the next three years Clews worked with his plane-table compiling topographic detail for mainly one-inch-to-one-mile military survey maps around Adelaide with some time spent around Melbourne. This work included trigonometric surveys by triangulation to control the plane-table topographic surveys. When the Australian Survey Corps (Permanent) was formed in July 1915 he returned to Western Australia to work around Perth, Albany, Northam and Toodjay under Lieutenant Thomas A Vance (later Colonel and the first Second World War Director of Survey Army Headquarters). Clews was around Perth when he was finally allowed to enlist in the Australian Imperial Force (AIF), in late-1917, as part of the AIF survey draft which was sent to France, arriving there early-1918. To enlist in the AIF he had to revert in rank from Company Sergeant Major to Sergeant. In France he worked again with Lieutenant Vance (under the British Depot Field Survey Company) on new survey triangulation and assessing the suitability of existing French triangulation for military survey.

After returning to Australia in mid-1919 and discharging from the AIF, Clews again took up with the Australian Survey Corps (Permanent) soon to be again the Survey Section RAE (Permanent). He returned to Western Australia to continue the work where he left off when he joined the AIF. Here again he worked under Lieutenant Vance. After finishing the outstanding work in WA, Clews was ready at the end of 1920 to join Lieutenant Vance then in QLD when he was re-directed to NSW to join Lieutenant Davis' sub-section. There he worked around Newcastle, Maitland, Cessnock, Singleton, Windsor, Wiseman's Ferry, Wollongong, Nowra, Bathurst and Katoomba being promoted to Warrant Officer Class One in 1922. In 1933 Clews was appointed Lieutenant in the revived Australian Survey Corps (Permanent) and appointed Officer-in-Charge No. 3 Section responsible for geodetic triangulation and topographic military survey in NSW. This he did until the beginning of the Second World War being promoted provisionally Captain in 1937. The 1930s was a decade of huge technological change for military survey with improvements in: theodolites and baseline measurement methods for geodetic triangulation networks; geodetic survey network adjustment adopting the method of 'least squares'; the QLD, NSW, VIC and SA state based geodetic trigonometric networks were bought onto a common system; introduction of systematic aerial photography and slotted template systems for topographic compilation; and adoption of the transverse Mercator projection for cartography.

At the outbreak of war in September 1939, Captain Clews commanded sixteen soldiers and four civilian chainmen in No. 3 Section. A few months later he not only commanded the section but was also appointed as Deputy Assistant Director Survey (Eastern Command). A year later he was seconded to RAE to raise and train 2 Aust Field Survey Company RAE from personnel seconded from No. 3 Section Aust Survey Corps (Permanent), 1st Field Survey Unit RAE (Militia) and new recruits. Major Clews (promoted in 1940) remained in command of the Company for nearly four years while his headquarters, sections and smaller detachments worked in New South Wales (Newcastle, Dungog, Sydney, Kyogle, North Coast, South Coast), Australian Capital Territory, Queensland (Toowoomba, Fraser Island, Childers, Rockhampton, Gulf of Carpentaria, Cape York, Ingham), New Guinea (Lae, Nadzab, Huon Peninsula), Dutch New Guinea (Merauke), New Britain (Jacquinot Bay, Wide Bay), Bougainville.

In mid-1944 'the Major' was unsuccessful in applying to transfer to the AIF, simply because at age fifty-four he was nearly ten years over the age limit for his rank in the AIF. He then reluctantly relinquished command of his beloved company to be posted as Staff Officer Survey Headquarters NSW Lines of Communication Area. At the end of the war 5 Aust Field Survey Company AIF, originally from QLD, returned from Morotai to Wongabel QLD (Atherton Tableland) then moved to Sydney.

In 1946, the Commonwealth Government offered assistance to Victoria and New South Wales to investigate the feasibility of diverting and controlling headwaters of rivers in the Snowy Mountains to flow west mainly for agriculture in NSW and VIC. The only organisation capable of conducting an initial feasibility survey was the Australian Survey Corps. One survey was to be on the western side of the mountains, based from Khancoban NSW and the other on the eastern side from Jindabyne NSW. In August 1946, a survey team from 5 Company commenced work from Khancoban and a few months later after the snow started melting another team commenced work at Jindabyne. 'The Major' was then a staff officer but field work was his passion and he managed to involve himself with some of the field survey work with 5 Company. In 1948, on what is believed to be his last field survey work in the Corps, 'the Major' had to be strongly discouraged not to traverse down the Kosciusko to Swampy Plains spur on foot to conduct a barometer heighting survey after a heavy snowfall the night before the planned task. The 5 Company surveys were completed in 1948. In July 1949, Major Clews was five months short of sixty years of age, then the compulsory retiring age, and he decided to retire after thirty-seven years of service with distinction to military survey including in two world wars. On retirement he was granted the honorary rank Lieutenant-Colonel. He was a legend, known as 'the Major' to all in the Royal Australian Survey Corps and 'Clewsie' to his friends. When he passed away in 1980 he was the last of the original members of the Australian Survey Corps founded sixty-five years earlier.

Major Clews should not be confused with the other 'Major' involved with surveys for the Snowy Mountains Scheme. Major Bert Eggeling, who had been one of Major Clews' Warrant Officer licensed surveyor recruits, and then Lieutenant, in No. 3 Section Aust Survey Corps 1936-1939, was Officer Commanding 5 Aust Field Survey Company AIF when the unit began the initial Snowy Mountains Scheme feasibility surveys in 1946. In 1948 he was appointed the first Officer Commanding and Chief Instructor School of Survey before resigning from the Army to be appointed in 1950 the first Chief Surveyor of the Snowy Mountains Hydro-Electric Authority. In that capacity he was most humbled and very grateful when his friend 'Clewsie' asked if he could 'help out' with what became Australia's largest ever and most complex and challenging engineering project. 'The Major' came out of retirement at age sixty to be appointed Senior Surveyor responsible for all field survey operations, remaining in that job for eight years.

Women in Uniform

By: Peter Jensen

On 13 July I sent an email about an exhibition 'Women in Uniform' to be produced next year by the Army Museum South Queensland at Victoria Barracks, Brisbane. I have not received any requests for further information and have compiled the following summary of women who served in Australian Survey Corps units and Survey Directorates as members of Australian Women's Army Service (AWAS), Women's Royal Australian Army Corps (WRAAC), Royal Australian Survey Corps (RA Svy) and other Army Corps. Sources include: the Royal Australian Survey Corps Nominal Roll 1910-1996, Australia's Military Map Makers by Chris Coulthard-Clark, Map Makers of Fortuna by Val Lovejoy, National Bulletin of Survey Corps Associations

and Australian War Memorial photographs. I welcome comments before I send the article to the organisers for their considerations.

The ceremonial chief of the Royal Australian Survey Corps was its Colonel-in-Chief, Her Royal Highness The Princess of Wales (Diana). The Corps and the Princess of Wales shared their birthday, 1 July. Unfortunately the Corps' ceremonial connection with its Colonel-in-Chief never included her visiting Corps units, but birthday wishes and Christmas cards, often with family photos of the two young Princes, were always exchanged. Diana's ceremonial appointment as the Royal Australian Survey Corps' Colonel-in-Chief was her only official connection with any unit of the Australian Defence Force.

Women first served in survey units in the Second World War

Australian Army Women's Service – enlistment by States

- New South Wales – 2
- South Australia – 5
- Tasmania – 1
- Victoria - 73
- **Total – 81**

Of the 600 people who served at Land Headquarters Cartographic Company (Bendigo) 1942 – 1945, 80 were AWAS. From early-1945 at least four of the eleven staff of Directorate of Survey Headquarters First Australian Army at Lae in New Guinea were AWAS. They were amongst the 500 authorised by the Australian Government to serve in an active service area, to release men to serve in the forward operational areas. AWAS private soldiers serving in survey related positions had the rank 'Sapper' like their male equivalents.

Survey Directorate (Lieutenant-Colonel Alan Kurrle) Headquarters First Australian Army, Lae, New Guinea – May 1945. AWAS soldiers are believed to be Private Olga Finucane, Sergeant JM Thomson, Sapper Joy Bailey, Sapper Joan Streicher. (Photo: National Bulletin of Survey Corps Associations No.12, September1976)

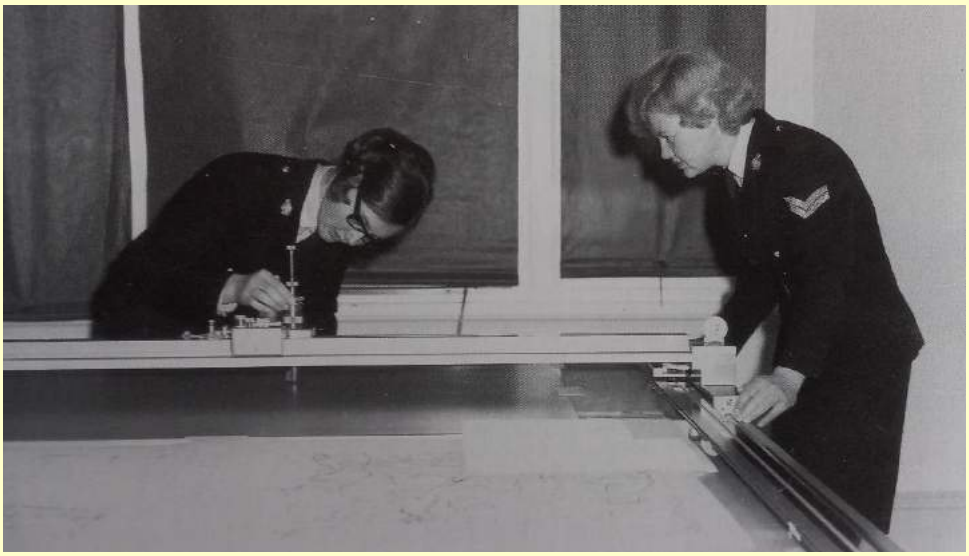
Twenty-three year old draughtswoman Sapper Joan Streicher from Adelaide SA updating maps at Survey Directorate Headquarters First Australian Army, Lae, New Guinea – May 1945 (Photo: Aust War Memorial)

Twenty-two year old Sapper Joy Bailey from Sydney NSW using a stereoscope and aerial photographs to update maps at Survey Directorate Headquarters First Australian Army, Lae, New Guinea – May 1945 (Photo: Aust War Memorial)

Post Second World War (1952 – 1996)

At the end of the war most women were discharged from the Army and AWAS was disbanded in 1947. When the WRAAC was formed in 1952, draughtswomen served with the Southern Command Field Survey Section based in Melbourne. In 1957, the WRAAC detachment moved to Army Headquarters Survey Regiment (Bendigo).

AHQ Survey Regiment, Bendigo VIC – 1964 Topographic Draughtswomen editing map compilations, by scribing over light- tables, before photographic processing to prepare for lithographic printing (Unit photo album)



AHQ Survey Regiment, Bendigo VIC – 1970 Topographic Draughtswomen Sapper Desi Asaris (left) (from South Australia) and Corporal Kalen Sargent (from Queensland) scribing a map grid on the coordinatorgraph, one of the early computer assisted mapping equipments (Unit photo album)

In 1977 the soldier survey trades Topographic Surveyor and Topographic Draughtsman were reorganised as one trade, Technician Cartographic. Training for women was the same as for men including qualifications in field survey, photogrammetry and cartographic draughting. Women also served in other RA Svy sponsored trades of Technician Photographic, Technician Print, Illustrator Reprographic and Photographer Still. When the WRAAC was disbanded in 1983, women who were qualified in a RA Svy sponsored trade were transferred to RA Svy. But it was not until 1987 that women were allowed to serve in field survey units and deployed on operations. In 1989, there were nine women of the fifty-eight members of 4 Field Survey Squadron (Adelaide).

Army Survey Regiment, Bendigo VIC – 1991 Technician Cartographic Sapper Jeanette Lane (from NSW) plotting three-dimensional digital topographic data from aerial photographs using a computer assisted stereographic photogrammetric plotter - WILD B8 part of Automap 2 computer assisted mapping system

Army Survey Regiment, Bendigo VIC – 1991 Technician Cartographic Sapper Jodi Bowman (from NSW) editing digital topographic data as part of cartographic completion on a graphic edit workstation - part of Automap 2 computer assisted mapping system

Female officers and soldiers also served in other than technical roles such as command, staff, administration and discipline. Marjorie Knight was the first female Warrant Officer Class 1 in the Survey Corps, serving in Army Survey Regiment (Bendigo) as Technical Warrant Officer, Squadron Sergeant Major and President of the Sergeants Mess Committee. Alison Black, a graduate of Royal Military College of Science at Shrivenham, UK, was the first female officer of the Survey Corps to be promoted to Lieutenant-Colonel. In 1998 Alison was awarded the Conspicuous Service Cross for her service. Tara Bucknall was the first female Survey Corps officer to command an Engineer Regiment and to be promoted to Colonel. Other women who started their Army service in the Survey Corps later rose to senior positions in other Corps.

Women's Royal Australian Army Corps (WRAAC), Royal Australian Survey Corps (RA Svy) and other Army Corps women who served in survey units – enlistment by States post-Second World War

- Queensland – 72
- New South Wales – 153
- Victoria – 165
- South Australia – 43
- Western Australia – 61
- Tasmania – 17
- Northern Territory – 3
- Papua New Guinea – 2
- **Total - 516**

This is about thirteen percent of the 3,948 men and women who served in Survey Corps units after the Second World War. At that time, that was a higher percentage of women than the Army average, which for 2023 the target is fifteen percent.

Airborne Profile Recorder/Recording II (APR) Prototype and Operational Recollections

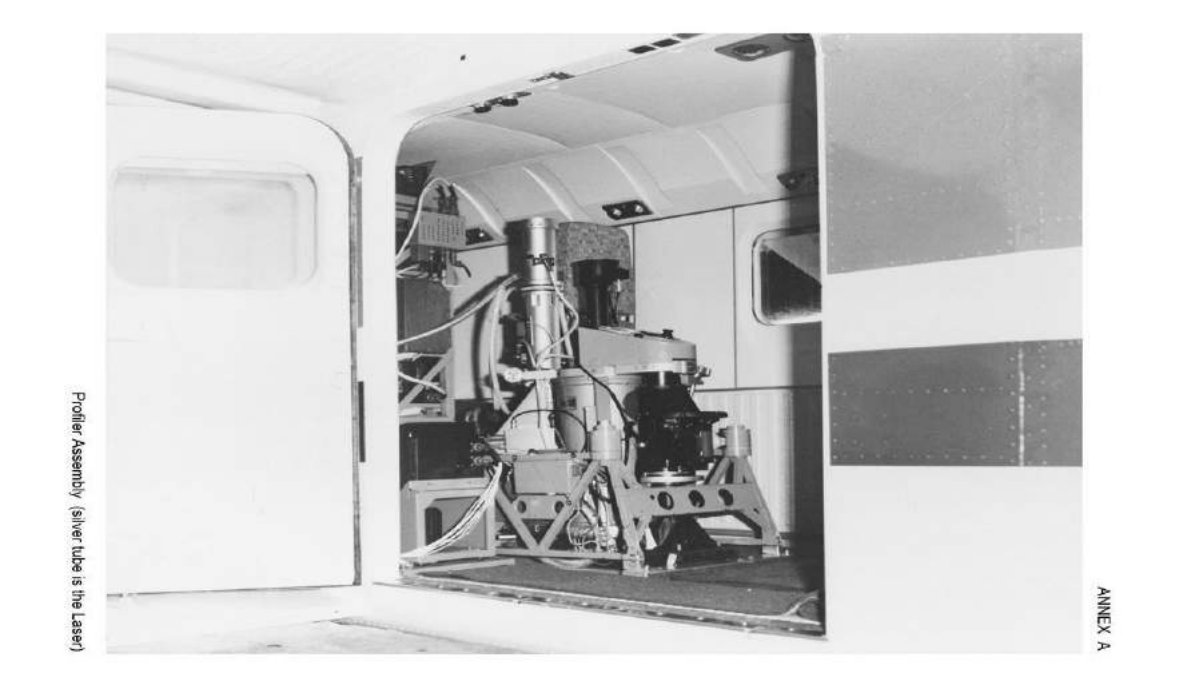
By: Peter Demaine

Military Biography

Peter Demaine graduated from Royal Melbourne Institute of Technology with a Bachelor of Applied Science, Degree in Surveying in 1978. Peter enlisted in Melbourne on 11 July 1979 as a survey cadet at the Officer Cadet School (OCS), Portsea. He graduated from OCS and was subsequently posted to most Royal Australian Survey Corps (RA Svy) units; Royal Military College of Science at Shrivenham, UK; and various non-Corps postings. Career highlights were: Officer Commanding 4th Field Survey Squadron (4 Fd Svy Sqn) the last Fd Svy Sqn prior to disbandment of RA Svy; Officer in Command of the Airborne Profile Recorder (APR) team 2 Fd Svy Sqn; Operations Officer 4 Fd Svy Sqn; Troop Commander Aerotriangulation Troop. Peter discharged from the Army as a RAE Major in Canberra on 13 July 1999.

WREMAPS, DSTO, NATMAP and RA Svy

The Laser Terrain Profiler, WREMAPS I, was developed by the DSTO Weapons Research Establishment (WRE) Salisbury SA at the instigation of the Division of National Mapping (NATMAP) to meet defined operational requirements. NATMAP flew over 250 000 kilometres of laser terrain profiles from 1970 to 1979. These profiles have provided vertical control for the photogrammetric plotting of 2.7 million square kilometres (the area of Australia is 7.7 million square kilometres) at a scale of 1:100 000 with a contour interval of 20 metres. Figure 1 (NATMAP photo) shows the WREMAPS I laser profile assembly.



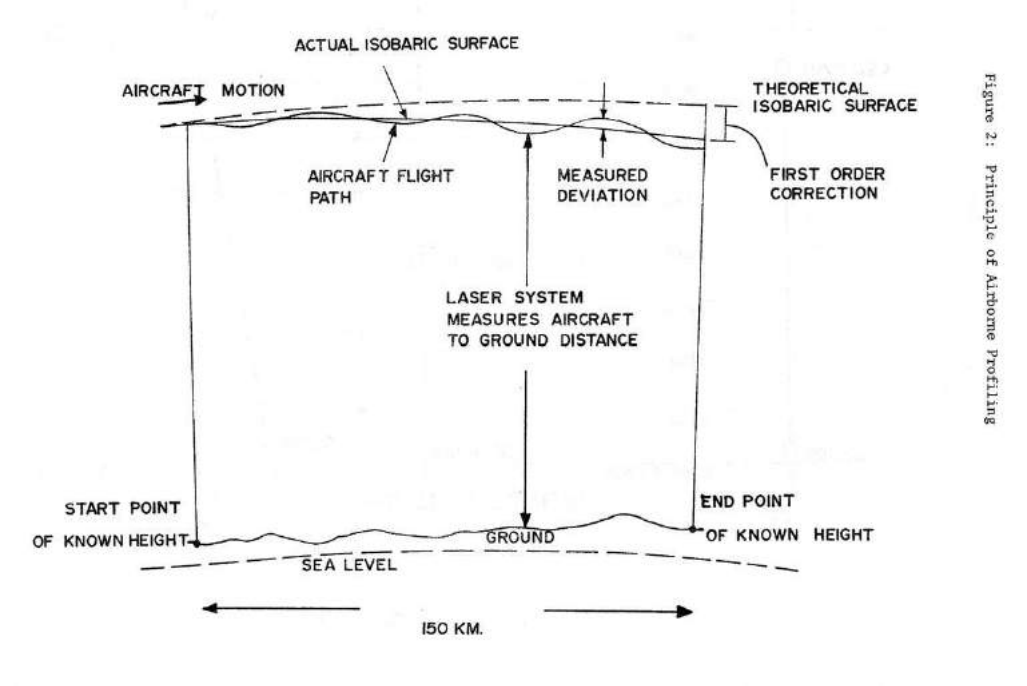
Defence Science and Technology Organisation (DSTO) pioneered the application of laser research to terrestrial mapping for a system to aid topographical survey of land surface profiles in Australia. This followed from research led by Fred F. Thoneman into the use of laser technology soon after the discovery of lasers in 1960. The airborne laser terrain profile recorder (APR) that was fundamental to the system was designed by Mike Penny from the WRE and developed during 1968 to 1974. Mike's work for the Department of the Army, the APR developed under the WREMAPS-II program, went into service with RA Svy from 1974 to 1985 to replace barometric heighting. APR was able to measure and record ground profiles

from aircraft flying at altitudes up to 5,000m above ground level. These altitudes are particularly useful for APR operations in Indonesia and PNG due to the height of terrain and mapping requirements. *(Editor: An earlier Airborne Terrain Profile Recorder, radar based, was used by RA Svy to map the Territory of PNG/Indonesia border in 1963.)*

The WREMAPS-II APR prototype was developed and tested in Australia by DSTO. Note that a production version of the APR was never made. The APR consisted of a mechanically still structure with a low power laser transmitter, a receiving telescope, barometric reference unit (BRU), UV chart data recorder, digital data recorder and a 70mm strip camera to photograph the ground immediately below the aircraft. The receiving telescope looked at the same patch of ground that the transmitter illuminated and collected an extremely small fraction of the laser light scattered from the ground. By measuring the time taken for the laser light to make the return trip from the transmitter to the ground and back to the receiver, the distance between the aircraft and the ground was measured. The strip camera recorded the precise track of the laser beam across the ground on 70-millimetre film. The prototype also included a Wild RC10 super-wide angle air survey camera to assist with matching the vertical profiles to mapping photography.

The APR laser generated short duration pulses of green light at a rate of 25 pulses per second. These light pulses were directed vertically downward from the aircraft in a narrow beam. Each pulse was scattered by the terrain, and a small proportion were detected by the optical receiver located in the aircraft. When the transmitted pulse left the aircraft, a 300 MHz counter was started, and when a reflected pulse was received the counter stopped. The number of pulses counted within this period corresponded to the number of half metres between the aircraft and ground.

It was necessary to determine the aircraft position with respect to sea level for the profile plot to yield true ground height information. This was achieved by flying the aircraft along an isobaric (constant pressure) surface using the BRU. Any deviation of the aircraft from this pressure surface was recorded and used to correct ground-height information. If a profile run (typically 120 kilometres) could be made between two points of known height, correction could be made for any slope in the isobaric surface. See Figure 2 (NATMAP diagram) below.



Another innovation developed by Australia's defence scientists was the Weapons Research Establishment Laser Airborne Depth Sounder (WRELADS) program see Annex A.

Vertical Control

The APR recorded a height profile over the land as the aircraft flew a grid pattern of sorties to capture height profiles. APR was used by the RASvy Corps in Defence Cooperation Programme mapping projects in PNG and Indonesia in the 1970's. RASvy deployed the APR across northern parts of Australia, western NSW, and around the Lake Hume region of northern Victoria, through the 1970's and 80's.

Principle of Airborne Laser Profiling

The distance between ground and aircraft is determined by comparing the phase of the transmitted and reflected laser light, which is continuously recorded on the UV chart and digital data recorder.

By flying over points of known elevation at the start and finish of each flight line and applying an accurate correction provided by the Barometric Reference Unit which continuously senses small changes in the flying height of the aircraft, the height datum is established and misclosure calculated and proportioned along the line. The heights of any intermediate points can then be derived, see Figure 2 above.

In practice, heights are obtained from profiles flown in a rectilinear pattern (i.e. N-S and E-W profiles) over the area to be mapped. As the levelling control net is marked on the ground only at intervals of some kilometres road profiles between known heights are used to connect to each intersecting profile. Profiles ending over the coast use sea level data interpolated between 2 tidal gauges.

The bench marks, road profiles and sea level heights provide the datum for the profiles and enable heights of the intersection points to be calculated. These intersection points are used to calculate loop closures across the entire network. If loop closures associated with a profile are too large, the profile is reflown.

RA Svy APR Equipment

The RASvy APR equipment consisted of a narrow beam laser distance measuring system, a barometric reference unit (BRU) to establish a height datum at the start of each profile and sense small changes in pressure along the profile, a special continuous-strip 70 mm camera to record the track, gyroscopes to sense pitch and roll of the aircraft, and associated support equipment, including a UV paper chart recorder for displaying all relevant data and a Texas Instruments digital profile recorder. A Wild RC10 super-wide angle air survey camera was used to connect APR profiles to current mapping photography. The APR equipment and RC10 camera were fitted into a leased Queenair aircraft. The crew consisted of a civilian pilot; and a RA Svy team consisting of a navigator, APR operator and RC10 air camera operator. On the ground there was a mobile darkroom with facilities to develop RC10 and 88mm photography. A Texas Instruments digital computer was used to extract APR digital data. UV chart data was extracted directly from the chart.

Profiling by RA Svy in Australia

The Lake Hume region was used for training APR teams and calibration of equipment, and at the start of APR operations coastal waters were used for calibration of equipment. RAEME technicians serviced the APR at Mascot Airport and in the field with limited spare parts provided by DSTO. RC10 cameras were serviced under a commercial contract. The Navy's WREMAPS development was aided by lessons learnt from the APR.

In Australia the aircraft would fly at a constant pressure height of around 10,000 feet above Mean Sea Level (MSL) when profiling. The pilot would aim to keep the aircraft at a fixed altitude referencing the BRU, and minimising pitch and roll. Profiling was usually done in the morning, where possible, to avoid turbulence and cloud build up (consequently dry season operations in northern Australia). The aim was to establish a network of North/South and East/West profiles, covering one or more 1:250K mapping areas tied into existing vertical ground control (e.g. Bench Marks, sea level heights interpolated from tidal gauges, etc.) at each end of the profiles and within profiles. The APR team would aim to fly profiles over open country avoiding forests so the laser beam could obtain the clearest profile of the ground. Intersection points (IPs) between N/S and E/W profiles were planned to be in open country.

Profile height differences at IPs were used to calculate errors within the network, and reject profiles causing errors greater than tolerances set in the APR Standard Operating Procedures. The APR navigator would direct the pilot to the location of the profiles, keep the pilot on track for the duration of the profile and advise the APR team when nearing IPs. The APR operator, looking down through strip camera, would advise when IPs were crossed and the air camera operator would take a photograph. The air camera operator also ensured that suitable aerial mapping photography was taken of each profile. After returning to base at the end of profiling each day the APR team would ensure that UV charts, digital cassettes, 88mm strip films and mapping photography were readable and within APR data and mapping photography standards.

Performance Observations of APR Equipment on RA Svy Operations

APR equipment and parts had become worn and temperamental by the early 1980's after years of operations in Australia, PNG and Indonesia. RAEME technicians were able to keep the equipment serviceable with spare parts provided by DSTO.

Lag between aircraft pitch, roll and isobaric height; and data recorded by the APR system induced errors. Experienced pilots were used to minimise these lag induced errors.

APR teams generally consisted of experienced operators and those who had recently graduated from School of Military Survey APR training courses. This approach meant that new members got valuable operational experience under the watchful eye of seasoned members, and operational lessons learned were passed onto them.

I was very privileged to work with many fine RA Svy APR team members, RAEME technicians and civilian pilots during my career. I got paid to do a job I loved doing and to see vast regions of Australia that I had never seen. I met many interesting characters wherever I was based for APR operations, but they are stories for another day.

Key Personnel

Bob McHenry led APR operations in PNG and possibly Indonesia. Bob was a great font of APR knowledge for me from my days as Troop Commander Aerotriangulation Troop. Others who gave me a deeper understand of APR, vertical control and mapping photography requirements were Mick Dempster, Rusty Williams, Phil Boyle, Don Musgrave and Bruce (Happy) Hammond.

I led three APR operations and assisted in another one. These were:

- Op NERVOSE 84 in the Arnhem Land based at Ngukurr, Barkly Tablelands and Elliott regions of the NT;
- Op ARIGHT 83 in Gulf of Carpentaria and Cape York Peninsula of Queensland based at Normanton;
- 1984 operation in Western NSW operation based at Narromine in 1984; and
- Assisting Pete Clarke for Op MIZMAZE 83 in the Kimberley region based at Kununurra.

Andy McLeod led the APR course that trained Pete Clarke and I at SMS. Derek Stanmore a member of my APR team at 2 Fd Svy Sqn, was very experienced and helped me better understand the APR operational aspects. I had good APR teams for operations including people like: Doug Gay, Wolfgang Thun, Marty George, Simon (Andy) Capp, Roger Rees, Steve Hill, Hutch Hunter, Neil Jones, Peter (Spoon) Lefel, Steve Gloster and Dave Longbottom. Civilian pilots Keith Meggs and Jim Miller? Apologies to anyone I have missed due to my failing memory.

Operation work taught me a lot about myself and the need to always work as a team. Clear communication between all members of the team and a thorough understanding of the mapping control and photography requirements to be used by Aerotriangulation Troop were essential.

Videre Parare Est

Annex

WRELADS Program and DSTO

References:

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Dennis Puniard Microsoft power point presentation titled: "From Plane Table to Satellites: The changing role of Technology in Military Mapping over 1... dated 30 June 2015 for the Australian and New Zealand Map Society. http://www.anzmaps.org/wp-content/uploads/Puniard1b.pdf

ANNEX A - WRELADS Program and DSTO

Another innovation developed by Australia's defence scientists was the Weapons Research Establishment Laser Airborne Depth Sounder (WRELADS) program that has had a wide application beyond strictly defence needs. This is a self-contained, transportable bathymetric survey system that uses a pulsed laser mounted in a fixed-wing aircraft. It is the fastest and most cost-effective tool for surveying in coastal waters to a depth of 70 metres and in areas too shallow or otherwise hazardous for navigation. The Royal Australian Navy's Hydrographic Service had estimated that it would take 80 years to complete hydrographic surveys of Australia's continental shelf using shipborne acoustic depth sounders and sought another means of conducting the surveys.

Under the leadership of Mike Penny, a prototype was constructed (WRELADS I) and installed in a 'Beechcraft' Queenair aircraft. Test flights were conducted over South Australian and Queensland littoral waters between November 1976 and June 1977 to test basic design concepts. WRELADS II followed. This upgraded model, installed in a 'Dakota' aircraft, underwent 550 hours of flight trials over north Queensland, West Australian and South Australian waters between August 1979 and May 1984.

Tenders were called in 1987 for the construction and trial of an operational version, with BHP Engineering and its partner Vision Systems Ltd being awarded the contract in May 1989. On 28 January 1992, the Minister for Defence Science and Personnel Gordon Bilney launched the LADS optimisation trials and acceptance tests program at Adelaide airport. The Navy accepted LADS on 8 October 1993.

Which way north

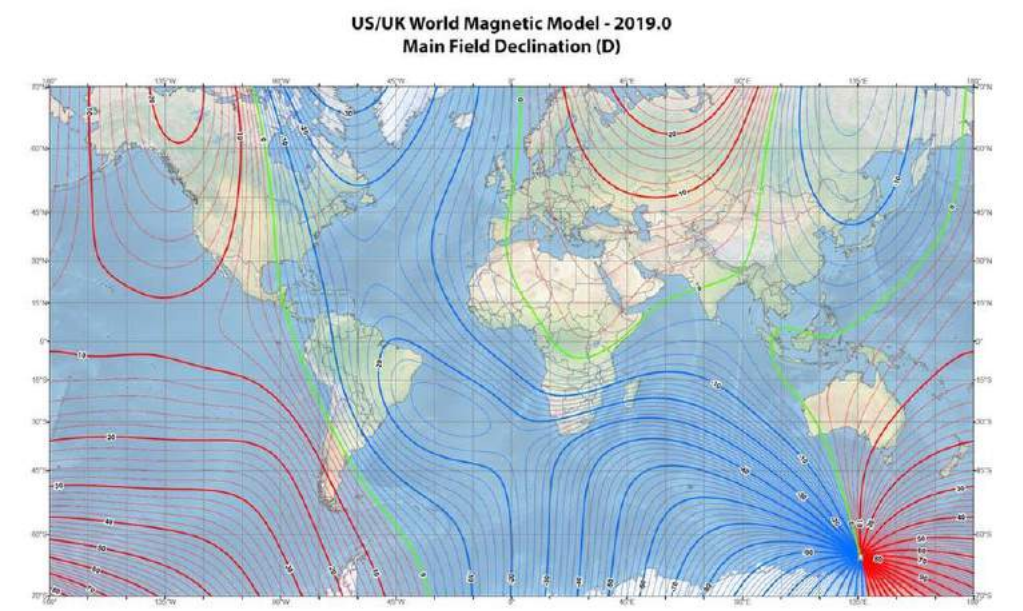
Editor: Information from Charlie Watson

Charlie came across this recent article about the alignment of True, Grid and Magnetic Norths in Great Britain https://metro.co.uk/2022/11/02/historical-alignment-over-uk-as-true-magnetic-and-grid-north-line-up-17684966/?ito=flipboard

That prompted Charlie to look into this in Australia and reports the following.

Australia also has a point where the difference between magnetic declination, Grid North and True North equal zero. However, in Australia the alignment will last for some time. For the next few years it will move up or down the central meridian of Universal Transverse Mercator (UTM) Zone 50 which is longitude East 117deg in Western Australia. The difference between grid and true bearings will always be zero on the central meridian of a UTM zone. The present zero value of magnetic declination runs from east of Perth in a North-Westerly direction. See the green line (isogonal) in the diagram below.

By a process of trial and error using the Australian Geomagnetic Reference Field Values application from AGSO, Charlie found the spot in November 2022 at latitude South 27deg 29min 45sec, longitude East 117deg 00min 00secs, about 220 km east of Kalbarri.



Vale – we shall remember them

Bill Harvey

36882 Warrant Officer Class One William (Bill) McDougall Harvey MBE (service 30 April 1959 – 10 January 1980) passed away in the Canberra region on 6 October 2022. Bill was an active supporter of our Association and contributor to this newsletter. Notice of Bill's passing attracted comments and memories from his friends and fellow soldiers from his more than twenty years of outstanding service to the Survey Corps, the Army and the nation.

After recruit and basic trade training as a Topographic Surveyor, Bill was posted to Army Headquarters Survey Regiment (Topographic Squadron), Bendigo, VIC in August 1960 where he was soon involved in the field survey detachment to Territory of Papua and New Guinea (June – October 1962) on the coastal First Order traverse. During this posting Bill's photogrammetric knowledge and skill was noticed and he was sent to School of Military Survey to attend a specialist photogrammetric operator's course. There he excelled, being awarded an 'A pass', something that was only awarded to exceptional students and then very reluctantly and in Bill's case only with the insistence of the senior course instructor. It was at Bendigo, that Bill met Philippa, another young soldier, and they married.

In December 1967, Bill was posted to School of Military Survey as an instructor and promoted to Warrant Officer Class Two not long after. In May 1970, he was posted to 1 Field Survey Squadron (1 Fd Svy Sqn) and immediately moved with the unit detachment to Territory of Papua New Guinea (TPNG) where the unit was establishing topographic survey control for scale 1:100,000 mapping. There Bill took on the challenging task of Second-in-Command Forward Operating Base which involved running day-to-day operations in supporting the remote survey teams and moving the forward base as required. After TPNG, 1 Squadron then concentrated on survey operations in northern Queensland. There Bill was the Operations Warrant Officer in Gulf of Carpentaria (1972) and Cape York (1973). Bill was the ultimate professional and example to all who he served with, being as a Warrant Officer Class One recognised with the award of Order of the British Empire (Member) – Military Division (MBE) for his outstanding service in the planning and operations management on Operation Sandy Hill 1975 (1 Fd Svy Sqn Group) on Cape York. In December 1976, Bill was posted to 2 Fd Svy Sqn (Sydney) and deployed on Operation Cenderawasih (Irian Jaya) May – August 1977 and again June – September 1978. As Operations Warrant Officer, Bill was responsible for detailed operational planning, survey standards and survey records. In November 1978, Bill commenced long service leave to complete a bachelor degree in surveying and mapping at the Western Australian Institute of Technology and elected discharge a year later. For his service Bill was awarded: Order of the British Empire (Member) – Military Division (MBE), Australian Service Medal 1945 – 1975 PNG clasp, Australian Service Medal – Irian Jaya clasp, National Medal, Defence Force Service Medal, Defence Medal.

Bill was remembered by his friends as: a real gentleman, a top bloke, the ultimate professional, bursting with exuberance and energy, highly respected by all ranks, always looked after his soldiers, knowing everything there was to know as a topographic surveyor.

Bill went on to work at the Papua New Guinea University of Technology and the Australian Survey Office, later Australian Surveying and Land Information Group (AUSLIG), Geodesy Program. In that capacity his service included: as a member of the Inter-Governmental Committee on Surveying and Mapping Working Party to revise Standards and Practices for Control Surveys; worked to establish the Australian Fiducial Network of geodetic stations; had a major role in establishing the Geocentric Datum of Australia 1994; and monitored geodetic survey aspects for Australian Government international aid projects in the Philippines. Bill was

a Member of the Institute of Surveyors Australia and a Member of the Association of Surveyors Papua New Guinea.

Bill was never one to cause (or appreciate) a fuss, requesting that he be cremated privately. Many of you would remember that Bill loved asian food especially Yum Cha, passing on a message for those wanting to remember him "Go to Yum Cha for me but remember, Chicken Feet are a definite must on the menu".

I thank John Bullen, Mark Heinrich, Richard Jackson-Hope, Ken Lyons, Rob McHenry, Don Swiney, Charlie Watson, ADF Service Records and Laurie McLean and Paul Wise (Natmap/AUSLIG) for their contribution to these memories and farewell to Bill.

On behalf of the Canberra Survey Corps Association, our sincere condolences go to Phillipa and their family.

An Army Pilatus Porter Beta descent over Daru TPNG 1970

By: Peter Jensen

Recalling my times with Bill Harvey in the field in Territory of Papua New Guinea, Gulf of Carpentaria, Cape York and Indonesia (Irian Jaya) I remembered us together at forward operating base Daru Island, Territory of Papua New Guinea in 1970 (1 Field Survey Squadron, Aerodist survey). Bill's job as Second-in-Command of the bases (previously at Bulolo, Kokoda and Kikori) was managing the day-to-day operations of moving and supporting the Aerodist remote teams making sure that the teams were in place at the right time for the Aerodist program.

From Daru Island I was an Aerodist remote operator for a couple of stations on small sandy islands in the Torres Strait. These stations were minimally marked and plastic panels laid for spot identification photography. Magnetic compass and tape measurements were made to air photo identifiable features such as trees, logs or low shrubs and a tree blazed if there was one suitable.

Bill liked to share the various tasks amongst his sappers and asked me if I would like to fly the spot identification photography of the Aerodist stations that I had established as well as a few others in the Torres Strait. Sure, that was something different. I knew nothing about the F24 camera, or any other air camera, apart from using air photography for map compilation. The camera was a frame mounted F24, in an Army Pilatus Porter PC6 Turbo short take-off and landing aircraft. But I was given the camera manual to read and a fifteen minute brief at the aircraft by another sapper who had spent a few days doing the same thing. Bill said that as it was a sunny day with a good weather forecast set the aperture and don't change it. The shutter speed may have been pre-set fixed. The main thing was to guide the pilot over the target so that it was somewhere in the middle of the photo frame and to manually wind on the film after each exposure.

After the brief from the pilot about how to wear and use the life jacket, as we were going offshore, and how to deploy the life raft which was my companion in the back seat behind the camera, just the two of us headed off towards the islands to be photographed which were about 80 km south of Daru in the middle of the Torres Strait. The camera frame was attached to the seat rails above and either side of the closed cargo doors and where normally the cargo/seat floor insert sits. The plan was to fly over each station at about 5,000 feet to take at least three photos then to do the same thing at 3,000 feet. The photos did not have to overlap although this was preferred. The flight axis was to be along the length of each island.

We got to photo altitude and the first challenge was to open the cargo doors. This meant taking off the seat belt and climbing across the camera to release the two 'bungee' straps behind the two cockpit seats then secure them at different points. This done it was then climbing back across the mount looking down through the open doors at the very blue waters of the Torres Strait. I don't think that I could have fallen out but I certainly fastened the seat belt when I got back there. The rush of cool air through the open cargo doors was a welcome respite from the hot and humid air on the ground. We found all of the survey stations, panels were still there, and the camera worked as hoped.

We headed back to Daru Island with the last task of the morning to photograph the survey station (a US Air Force HIRAN station of 1963) at the airstrip there. We did that along the direction of the runway with another run having climbed to 5,000 feet. I was still writing up the photography log when the pilot said that he was going to do a 'Beta descent' to land. I had no idea what a 'Beta descent' was. I thought we would circle around but then the aircraft noise lowered and we started to drop. I looked between the seats up-front through the front cockpit window to see the nose dipping quickly well below the horizon with the Daru airstrip soon appearing but looking very small. I told the pilot the cargo doors were still open and he said to close them. Not an easy thing to do with the Porter falling at a very high angle of descent. It seemed forever to get the overlapping doors locked properly and to get back to my seat. Not long after my ears stopped popping and the normal aircraft noise returned we levelled out not far off the 'piano-keys' on the end of the runway for a very short landing. I then had to find all of my bits of paper and pens around the cabin. The pilot was pleased with himself telling me that the descent rate was more than 4,000 feet a minute and that it was training for Vietnam. I don't know if a 'Beta descent' has ever been done with an air camera in the back since, or before. That was my one and only task as an air photographer.

The Pilatus Porter is one of the few aircraft, if not the only one, in the world approved to do 'Beta descents'. 'Beta' is when the angle of the variable pitch propeller is set to flat with no forward or reverse thrust. The propeller spinning at normal rate is essentially a big air brake. Porters are now popular in places like Papua (formerly Irian Jaya) and Papua New Guinea especially used for those small airstrips that have terrain obstacles on their approach where 'Beta descents' are helpful or in some cases essential. Skydiving companies also use them as a 'Beta descent' means that the aircraft can land to pick up the next group not long after the first group lands, or sometimes before the jumpers land. *YouTube includes instructive videos about Beta descents.*

A Pilatus Porter PC6 Turbo in a very steep Beta descent

This is the Army Pilatus Porter in support of the survey tasks at Daru Island in 1970. Here it was on a F24 spot photography task which included an emergency ration resupply to Aerodist team (Sapper Peter Jensen and Sapper Mark Johnson RE Svy) on Mount Amungiwa/An-lung-wiwa (height 10,750 ft), a primary geodetic station established by Aust Division of National Mapping in 1963. The resupply sand-bag, in the photo just near the left wheel, was dropped through the gap between the camera and the open bottom cargo doors by the camera operator Sapper Ross Smithwick. The sand-bag hit near the white target that was laid out and then exploded with tins going in all directions. We spent the rest of the day searching the wet mossy alpine grass and low scrub for our food. (Photo: Author)

Survey support - Main Battle Tank trials German Leopard 1 vs US M60A1 in 1972

By: Peter Jensen

Fifty years ago in November 1972 I was despatched, with one days' notice, from 1 Fd Svy Sqn (Gaythorne/Enoggera) to Townsville by civil-air along with two tellurometers MRA301 as excess baggage. I was to be attached to the Medium Tank Trials Unit (MTTU - redesignated B Squadron, 1 Armoured Regiment) to support the trials of the German Leopard 1 and the US M60A1 main battle tanks (MBT) one of which would be selected by the Government to replace the Centurion tank used in the Vietnam war. The Townsville area tropical trials followed initial trials at Puckapunyal. The Royal Australian Armoured Corps MTTU tank crews and Royal Australian Electrical and Mechanical Engineers (RAEME) maintenance teams were trained earlier in Germany and the US.

Survey Section, 131 Divisional Locating Battery (Royal Australian Artillery) was tasked to provide survey support for the trials. The main task was laying targets on ranges to test the accuracy of the main guns (105mm on both tanks) range-finders of the fire control systems over different terrain types and elevations and different environmental conditions of dust, smoke, day and night. The Battery's tellurometers were in for service and awaiting parts so they asked 1 Fd Svy Sqn for help. The unit answer was yes on the proviso that a Topographic Surveyor would go along with the two tellurometers.

Flying civil-air at that time was a novelty as the normal means of travel was by rail or Service Air, normally the weekly east-coast courier (RAAF C130) Townsville-Amberley-Richmond-Laverton-Edinburgh. I had no travel tickets or documents but was assured that a MCO (Movement Control Office) Sergeant wearing a red brassard with the yellow wagon wheel would be at the TAA (Trans Australia Airlines) Brisbane Airport terminal counter with everything needed. That was partly true as he had my air ticket but the weight/cost of the tellurometers in their backpacks in the wooden transit boxes was way above that on the freight voucher authorised by the trials admin officer. The MCO Sergeant then had to use a TAA phone for a local call to his boss at Enoggera to call Townsville long-distance to get

authority for the higher cost. That was taking forever so TAA took the value of the freight voucher as the cost of the excess baggage.

A Bombardier Artillery Surveyor met me at the Townsville airport to overnight at Lavarack Barracks. The trials started at Sellheim near Charters Towers west of Townsville for tropical dry dusty conditions and then moved to the Army Tropical Trials Establishment at Cowley Beach near Innisfail for trials in tropical humid coastal conditions and amphibious operations. In addition to the two MBT there was a Leopard Armoured Recovery Vehicle on the trial.

For the range finder targets, about a dozen car wrecks were purchased in Townsville and the RAEME Workshops spray painted them different colours from local terrain brown and green to bright rainbow colours. From the trials plan showing the different ranges to be tested over an arc of nearly 180 degrees, we used the MRA301s to find a target position with line of sight to the area where the MBTs would be. This was sometimes a lengthy process choosing a spot at the desired range (within about 10 metres) and where the RAEME 'Wrecker' could get to to drop the target car wreck. Once a position was chosen we measured the distance from the MBT positions to the target accurate to about 1 metre. Depending on the terrain, ranges were from about 200 metres to about 3,000 metres. For the range-finder trials the Trials Officer chose the target calling for example 'blue left' and the test was how long it took the MBT crews to determine the target range and to what accuracy. Range-finder accuracy was normally a function of distance and line-of-sight conditions.

At Cowley Beach there was no wind or background noise so we used a simple sound ranging method for the reconnaissance survey on distances up to about 1,000 metres by measuring the time taken from whacking a star iron picket with an axe until the sound arrived at the other end observed with binoculars and stop watch then multiplying the elapsed time by the speed of sound (about 330 metres per second). With a bit of practise the result was good to better than half a second or better than 150 metres.

After the trials, the Government chose the Leopard of which about 90 were delivered from 1976. They remained in service until 2007 being replaced by reconditioned US M1A1 Abrams MBT. Recovery and Engineer Leopards were also part of the fleet.

Australian Leopard 1 main battle tank on permanent display at the old Services Club (destroyed by fire), Manuka, Canberra. Note that the gun is pointed along Canberra Avenue towards Manuka shops and not the other direction with Parliament House at the end of the Avenue and well within range.

Photo Gallery – 1st Order theodolite and tellurometer traverse

Editor: From the 1958 First Order geodetic traverse by theodolite and tellurometer (MRA1) from Charters Towers QLD to Tennant Creek NT – Topographic Squadron AHQ Survey Regiment, Bendigo, VIC. Traverse 1,637 km establishing 62 stations.

Topo Sqn vehicles with trailers all the way from Bendigo VIC more than 2,700 km away. Are they Austin Champs which I have been told were on issue to Topo Sqn and replaced by Landrover Series 2 in 1960, or Ford Jeep?

At station A 418 – the tellurometer MRA1

Flat country required erection of Bilby towers to extend lines of sight for theodolite and tellurometer observations.

Digging the foundations

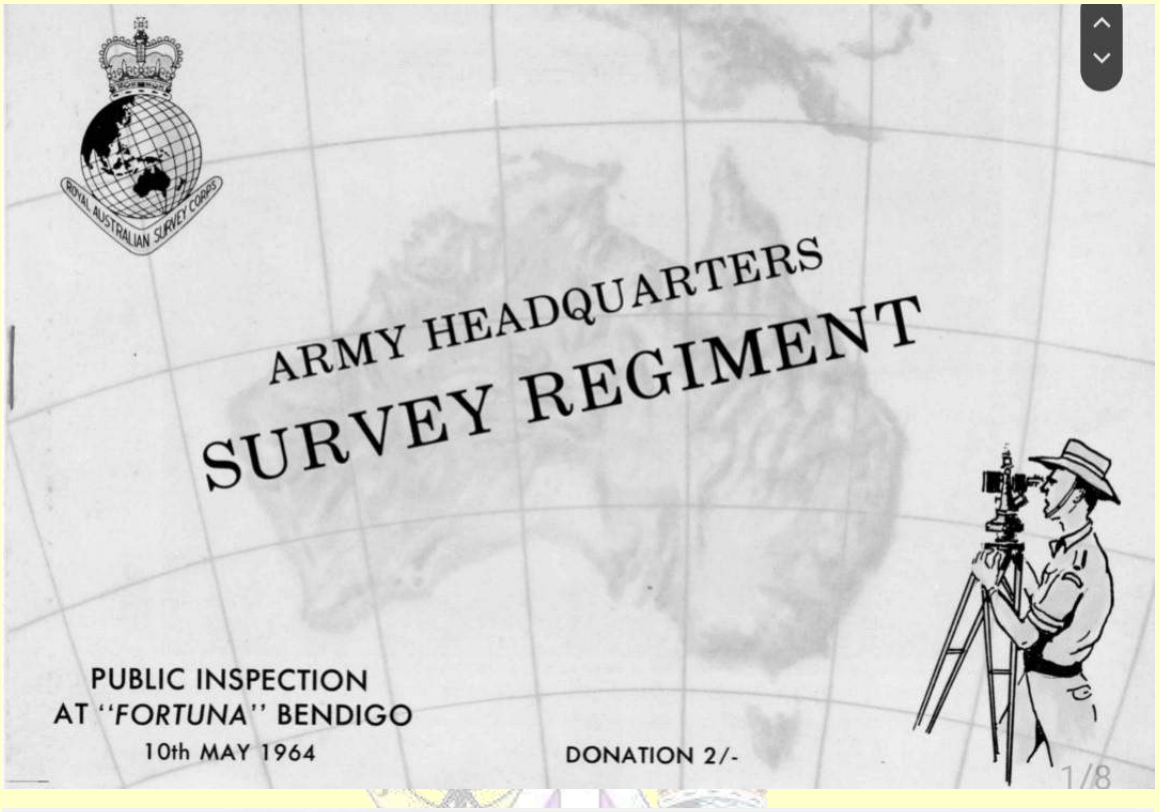
The inner tower frame above the survey mark was for the theodolite and tellurometer and the outer to support the observing platform

Five teams erected and dismantled twenty-five towers (about 20 metres high) mainly over the 500 km between Camooweal QLD and Tennant Creek NT.

See also the article in Newsletter No. 53, September 2021, *Warrant Officer Class 1 Ronald Newman*

AHQ Survey Regiment – Open Day 1964

Editor: Information provided by Norm McMurtrie



"Fortuna" was built by the Lansell family during the latter years of the last century and was maintained as a residence until 1934. The house itself is one of the oldest in Bendigo and it is a tribute to the original craftsmen that it is still in first class condition today.

FORTUNA TODAY.....

In 1942 the mansion was occupied by the Australian Survey Corps and "Fortuna" became the site of the base map production plant of the Australian Army for the remainder of the war years. During this period approximately sixteen million maps of Australian Territories and of theatres of operation in the South West Pacific Area, were produced for use by the Allied Services. This function was continued as a peace time role in the post war years, and in 1951 "Fortuna" was purchased by the Commonwealth Government.

4/8

FIELD SURVEYING.....

Landing ship "Harry Chauvel", equipped with helipad at stern, in survey operations in northern waters.

Helicopter lifting beacon from LSM "Harry Chauvel".

Distance Measuring Equipment, "Tellurometer" being used in Central Australia.

As the largest unit of the Royal Australian Survey Corps, AHQ Survey Regiment carries out mapping in all parts of the Commonwealth and Territories including Papua and New Guinea.

The Regiment is not only capable of doing its own field surveys but is responsible for the drawing and printing of map compilations from Royal Australian Survey Corps units in all States.

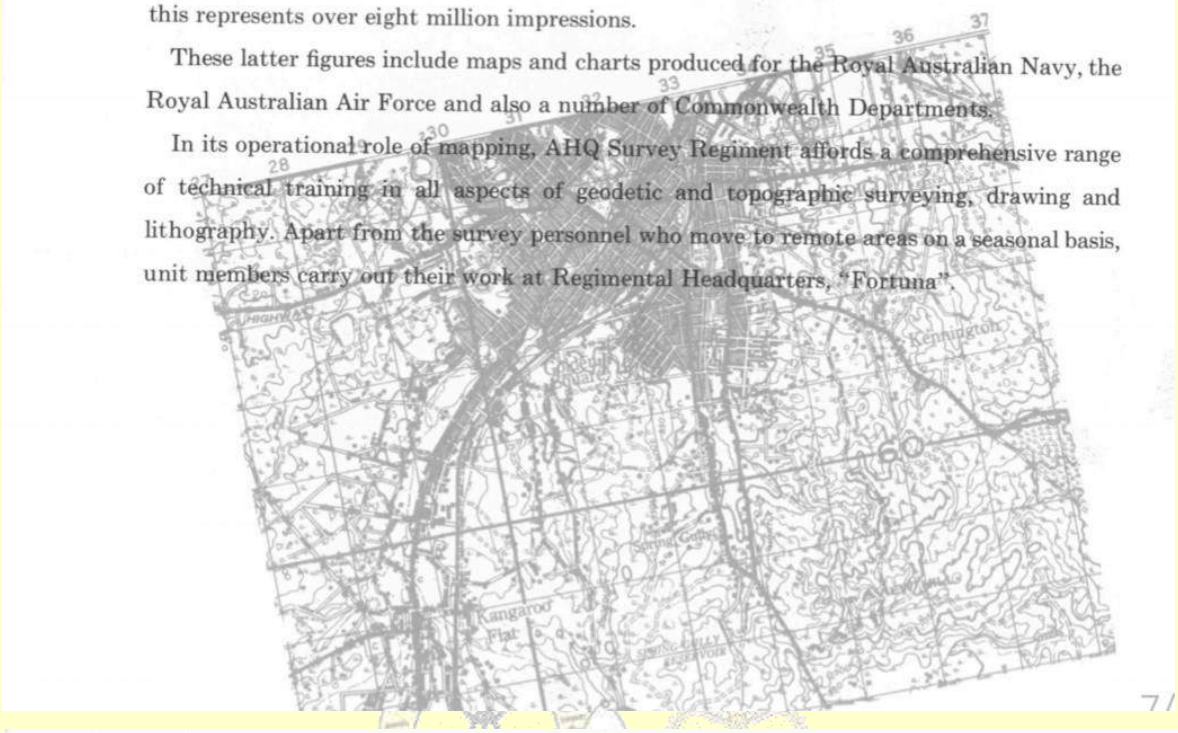
The Topographic Squadron is the element of the Regiment responsible for geodetic observations and map control, and in 1962/63 the squadron traversed approximately 2,000 miles in the difficult terrain of Papua and New Guinea. In addition, many areas of New Guinea were covered with survey ground control as a first step towards the production of large scale standard map sheets.

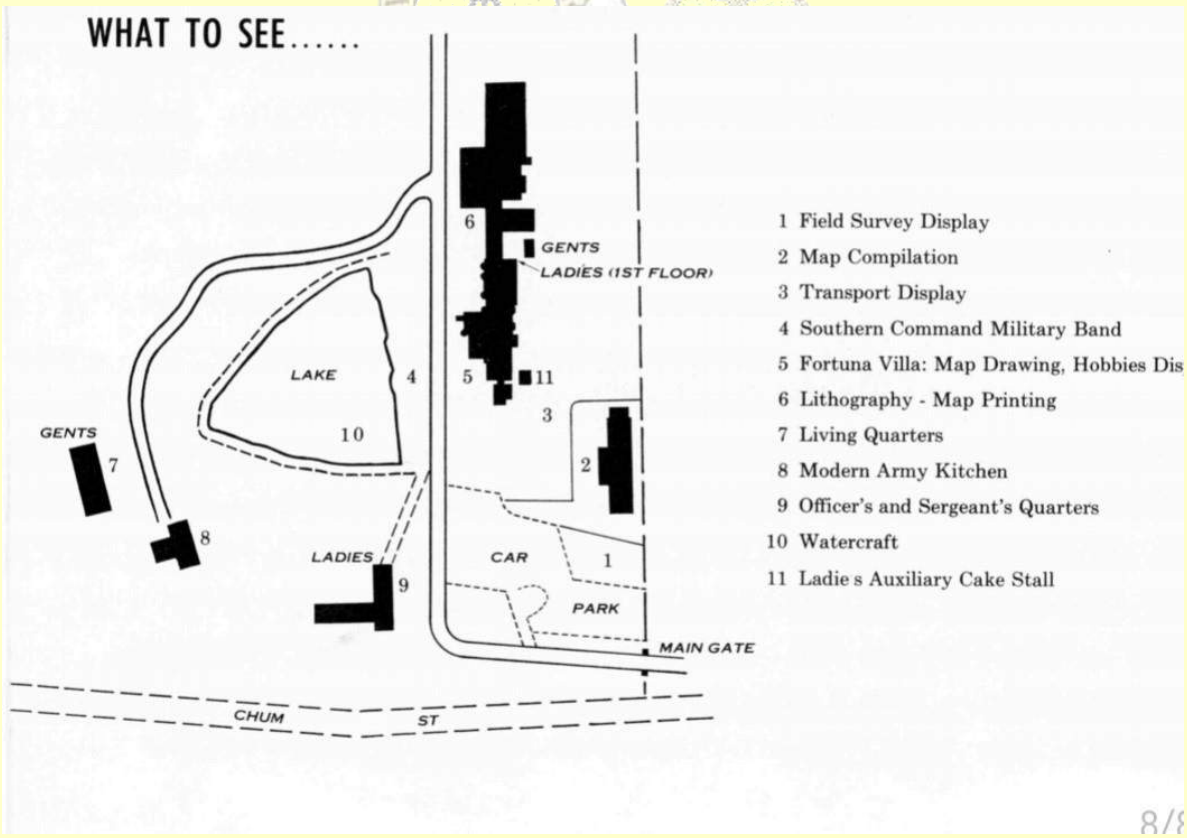
The immediate role of the Royal Australian Survey Corps in Australia is to cover the continent with a map series at the scale of 1:250,000 (approx 4 miles to 1 inch). In this connection, the draughtsmen and women have a capacity to produce maps covering an area in excess of 360,000 square miles per annum; but in fact this figure is reduced to some extent because of the additional commitment to map certain areas at a larger scale. However the new mapping each year is never less than 250,000 square miles.

The Lithographic printing element of the Regiment produces approximately one and a half million copies of multi coloured maps and charts each year. In terms of machine runs this represents over eight million impressions.

These latter figures include maps and charts produced for the Royal Australian Navy, the Royal Australian Air Force and also a number of Commonwealth Departments.

In its operational role of mapping, AHQ Survey Regiment affords a comprehensive range of technical training in all aspects of geodetic and topographic surveying, drawing and lithography. Apart from the survey personnel who move to remote areas on a seasonal basis, unit members carry out their work at Regimental Headquarters, "Fortuna".





Does anyone know what Stand 10 – Watercraft in the Lake was?

Beach Surveys

By: Charlie Watson

Editor: This is a comprehensive update of articles that appeared in Qld Bulletins 44 and 45.

The Requirement

In 1967 the Chiefs of Staff Committee had endorsed a requirement for surveys to be conducted to collect intelligence on the coast and beaches of the Territory of Papua and New Guinea (TPNG), to assess the suitability of areas for landing craft use in the event of a future military or civil disaster operation. The technical control of the Beach Survey rested with the Joint Intelligence Bureau (JIB) in the Department of Defence. It was decided to approach the UK about providing training for a Beach Survey Team, and during 1968 a naval officer and Lieutenant J.W. Bownds from Survey Corps were sent to England to undergo specialist training, which was intended to qualify them both to conduct such surveys and to instruct teams back in Australia. Once they had returned, the first field operation was got under way during March 1969 when the patrol boat HMAS Madang was dispatched with a seven-member team (two from the Army) to start work on the northern border of TPNG, near Wutung and progress east around the coast. The beach survey task was originally assessed as requiring about three years to complete, but on the basis of this first years' experience the expected duration leapt to 'some thirteen years, mainly owing to the absence of the vertical aerial photography, which was necessary to support survey activities.

The Aim

The aim of the survey is to obtain the following types of information:

- Beach Information
- Landing Place Information
- General Sector Information
- Changes in Port Information

The requirement was for a preliminary/recce survey rather than a full beach survey which neither Defence, or any of the services was prepared to fund. Such a survey would still be going. Full Beach surveys were conducted on some beaches in WA (OP Beachcomber) in later years and consumed considerable resources.

Preparation

About three months before departure from Australia the coast to be surveyed was studied, and orders place d for the maps, charts, air photos, Pilot Publications and Tide Tables etc.

The JIB had produced a publication which broke up the coastline into sectors and beaches and provided available information on those sectors and beaches and ports.

Check that local Defence and PNG authorities have been adequately informed about the forthcoming visits and that requests for local assistance can be met. The Army sometimes provided a land rover for land-based activities. The TPNG administration provided a Patrol Officer and local guides on occasions.

Check that stores and stationery are obtained/replenished for the survey.

Work of the Naval Officer

The Naval Officer is the CO of the team on whom will rest the overall responsibility for the accuracy of the report, the way beaches are assessed and written up. The Naval Officer is usually a Hydrographic Officer, but none was available for this Project.

In the field his work will be broadly as follows:

- Writing up notes and photography for the Sector Coast Report.
- Assessing and writing up sea approaches to beaches.
- Examination of the beach seaward of the back of the beach down to the L.W.L.
- Fixing obstructions and portraying beach features such as runnels on plans etc.
- Determining and running gradient lines from the back of the beach out to the 3-fathom line.
- Fixing any offshore hazards (rocks or obstructions) not correctly shown on existing charts.
- All photography of the beach up to the beach exits.
- Assessment of composition of beach and bearing capacity in conjunction with Military Officer.
- Ascertaining the nature of the seabed out to 3 fathom line.
- Establishing tidal datum and erecting tide poles if necessary.

Work of the Military Officer

Generally, commences work near the back of the beach and. in conjunction with the Naval officer assesses the bearing capacity of the beach for vehicles. This is best done by running a vehicle over the beach and assessing performance noting type of vehicle. If vehicles cannot be used, the bearing capacity must be assessed by footprints. The beach surface should also be dug up with a spade to a depth of about 24 ins to assess the material under the top surface. Samples are not required. It is most important to know whether a firm top surface covers a softer under layer which would cause havoc for heavy vehicles.

He assesses and photographs beach exits and describes the back of the beach from the point of view of cover (ground and air) and going capacity for vehicles.

He then works inland making notes and taking photographs for the hinterland report and pays particular attention to the following:

Exit roads from the beach, lateral movement on and behind the beach, obstacles such as ditches or bunds, cover from ground and air, bridges, culverts, helicopter landing areas, areas suitable for landing strips, covered storage for stores, water supplies, availability of engineer materials such as stone, gravel and timber.

If large scale maps (about 1/10,000) are available much of the written information about the beach and hinterland can be in the form of numbered notes and photos corresponding to numbered positions on the map.

Determining Beach Profile Line

Lay out transit at right angles to general line of beach. The distance apart of transit posts should be as long as possible and, not less than. 1/6th of maximum distance to which line is to be taken.

Lay out 100 ft base line either side and at right angles to transit line.

With level and staff, level from back of beach to waterline noting time at water line.

Continue line by wading along transit out to 4 or 5 ft of water. Fix by sextant angle to base line.

Sounding line is run in a boat along transit fixing by sextant angle to base line. Boat must run at a slow even speed if possible and fixes taken every 30 seconds. It is preferable to use a recording echo sounder to any other form of sounding.

If tide gauge readings at a nearby port are available then soundings and gradient line can be reduced to Chart Datum. If no tide readings are possible use predictions from Tide Tables.

If good land survey bench marks are available level down to a temporary bench mark on the beach. Chart Datum in relation to Local Survey Datum is usually known and value of BM above Local Survey Datum enables gradient line to be referred to Chart Datum.

Standards of Accuracy

Beach Survey Teams have to work more rapidly than land or hydrographic surveyors and are not expected to achieve such high standards of accuracy.

In positioning objects of importance, the aim should always be no plottable error on the largest scale in use. Check bearings angles or measurements should be taken whenever possible.

For distance an accuracy of 1 in 100 is adequate for beach gradient and sounding close offshore.

Levelling to and from bench marks for tide poles should be done carefully and errors should not exceed 0.05 feet per 2000 feet.

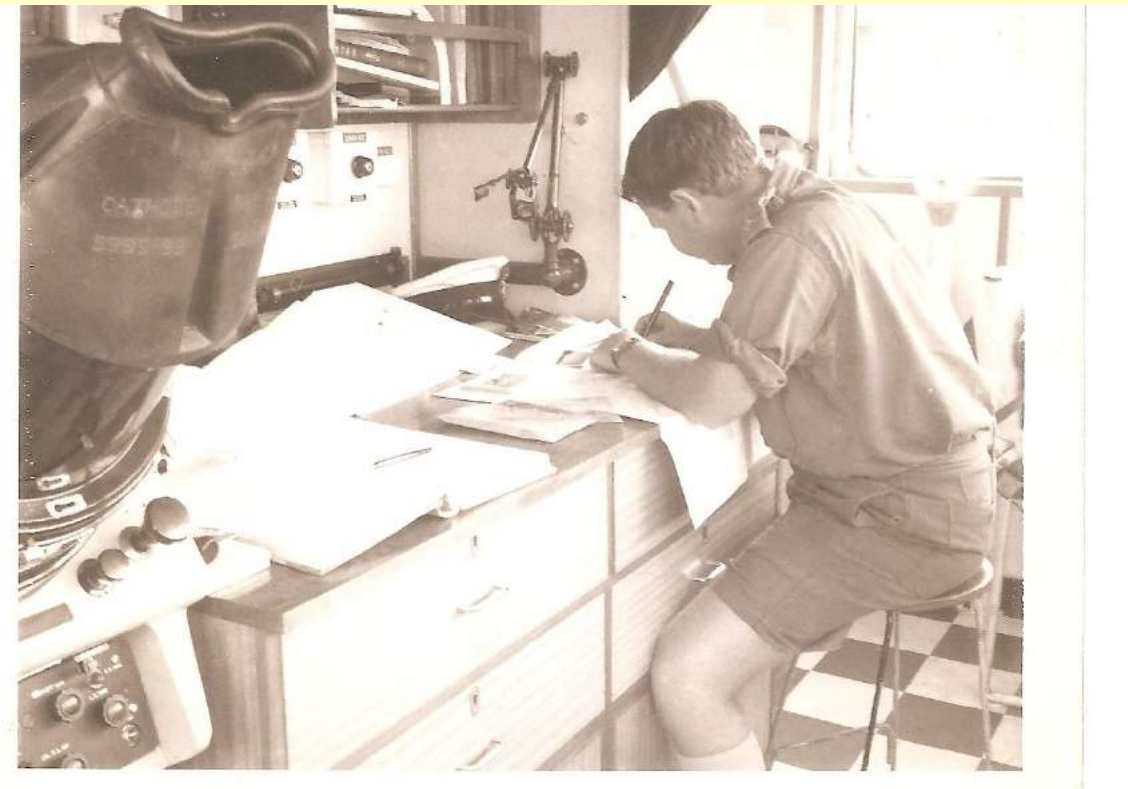
Levelling on the beach for gradient lines need only be accurate to 0.10 feet per 500 feet.

Soundings may be taken to +/- 0.5 feet but it is doubtful whether the accuracy will ever be better than +/- 1 foot.

Heights of important features, which are either not charted or inaccurately charted, should have their heights taken by vertical sextant angle from offshore. Beach obstructions should have their heights given either as drying heights above Chart Datum or heights above MHWS. If this cannot be done then their heights above beach level may be given from which an approximate height above Chart Datum may be obtained by reference to the nearest beach profile diagram.

Writing up the Report

The coastline will usually have been divided into convenient sectors and approximate beach limits on existing maps beforehand. These limits may be amended in the field if there are good reasons for doing so. No firm rule can be given for the size of a sector but usually they are about 60 to 120 miles in length and are arranged to fit geographical configurations or political boundaries.



Writing up reports at the chart table

A Sector Report will consist of:

List of Contents

Introduction

a. Date of Survey giving inclusive dates.

b. Name and rank of officers responsible for the Survey.

c. Position: Notes on methods used for obtaining positions on the ground, i.e., sextant angles to prominent charted features, compass bearings, measurement from charted objects, inspection of air photographs in the field. If this cannot be generalised. amplifying remarks must be made in the detailed. beach report.

d. Beach Profiles: Describe methods used to obtain beach gradients, i.e., level and staff,' echo sounding, Abney level, lead. lines sounding, rule of thumb methods.

e Tides and Reduction to Chart Datum: Notes describing method of reducing soundings and beach profiles to Chart Datum; i.e., tide pole readings, predicted tides, levelling to bench marks. If tide pole readings are obtained details should be attached on Form, H.143 together with description of bench marks used and included in the tidal section of the Sector Report or beach report

f. Measurements and distances: State method of measuring, i.e., tape, pacing, tachymetry, subtense angles, estimation.

g. Gradients inland: Give method of measuring.

Heights: State method of measuring heights and datum from which they are measured.

Detail: Notes on how additional detail shown on maps and charts has been inserted, i.e., traversed from known point sketched in by eye, taken from air photo.

Definitions and Glossary: If any special terms have been used in the report they should be defined in this section. Also, a glossary of local terms used should be compiled.

There is no need to repeat any well-established terms used in mapping, charting or beach survey work. Directions and descriptions should always be given with reference to the points of the compass.

The standard used to define beach bearing capacity must be defined ambiguous terms like forward and reverse, depth for horizontal distances, in front of and behind, should-be avoided, left and right limits of the beach should be defined by points of the compass. If such terms have to be used then they must be defined in this section.

Sector Coast Report

This section comprises the report of the whole sector under suitable sub-headings. If the sector is a very long one then there is no objection to sub-dividing the sector report into convenient geographical sections provided these sections are clearly marked and are indicated on the small-scale key plan.

General Locality and. Sector No.

From: Geographical location. Lat /Long. Chart No GR, Map No

To

Attached References: Other charts used in the report. Maps used in the report, published drawings or plans used in the report.

Photographs: Flight Nos. and serial of air photos used. Quote Nos of attached photos.

Other References: Other charts and maps which are referred to but not included in the report.

Other Photographs: Photographs which have not been used in the report but have been indexed. and are available.

Coast: Give approximate length of the coast (airline and coast line if deeply indented). Then describe the coast fully but concisely in a logical geographical sequence. Photographs should be used to augment the written description. Endeavour not to state that is obvious from the chart and maps, but only to amplify it from the landing aspect.

Landing Places: Beaches which have been fully surveyed are only mentioned by number and text refers to Beach reports. Beaches of lesser importance which have only been cursorily surveyed may either be included in the text of the coast report or cross referenced to a brief form of a beach report.

Other landing places, such as hards and small jetties may either he included in the text of the coast report or cross referenced to a report elsewhere in the volume of the report

Approaches: If the sea approaches to a sector are common to beaches in the sector, then the approaches should be described in this section. If each beach requires a special description, then cross reference this section as “See detailed beach reports”. There is no need to write up this section if the information is solely from charts and sailing directions. Only new information gained from the survey or local sources need be written up. This may mean modifying information given in Admiralty publications.

Anchorages: There is no need, to write up information taken solely from charts and sailing directions except to confirm, or otherwise their accuracy by inspection in the field.

If anchorages are different for each beach and cannot be conveniently described in this section, they should be written up in the beach report and cross referenced.

Weather: General remarks on the weather experienced during the survey of the sector with emphasis on the conditions produced for landing operations.

If a convenient brief on weather and climatic conditions for the area can be obtained locally, it may be summarised and included in this section.

The beach surveyor is not required to write up weather and climatic information already published in Bureau of Meteorology and. other publications. He should, however, read up published weather information about the area so that he can assess conditions likely to occur on a beach at different seasons.

Sea and Surf: This section may be common to all beaches in the sector, but if beaches are likely to experience different conditions, they should be written up in the beach report.

The beach surveyor is most likely to be working during the best weather conditions, but while in the sector he should endeavour to assess what conditions would be like at other seasons having read up the weather for the area.

Tides and Tidal Streams: If tidal conditions change over the sector, then give only broad outline in this section and details in beach reports. Otherwise give the following information:

- Tides Type of tide, M.H.W.S., M.H.W.N., M.L.LN., M.L.W.S., and spring and neap ranges. Any special remarks on shallow water and/or meteorological effects which were found.
- Tidal Streams: Direction and rates close offshore and any other information which may confirm or contradict published information.
- Currents: Information re currents along the coast or from rivers.

Hinterlands: A good deal of latitude must be allowed in writing up this report. In some cases, it may be more convenient to write the whole sector in this section. In others it may be better to write up most of the hinterland in the beach reports.

Whichever method is adopted, keep the wording concise and do not duplicate information.

- Describe the immediate hinterland up to the Main Coast Road or 4 miles inland whichever is the shorter. Only very brief remarks on the terrain further inland need be made.
- Remarks on cross country going conditions for infantry and vehicles and cover from observation.
- Areas of tactical or strategic importance which are accessible from observation.

Communications: General description of road and rail systems in the sector, but only amplify facts which cannot be readily appreciated from the maps.

- Main Coast Road: Describe the main coast road. throughout the sector giving type of surface, widths, describe borders

(soft/hard shoulders, drainage ditches, footpaths etc.) and supplement with photos.

Give details of bridges (length, width between parapets, road width, height of parapets, surface, type of construction, span, rise, size of arch ring, fill, height of abutment, clearance of arch above ground). Most of these details can be clearly shown by marking on photographs.

Details of culverts and describe any other possible bottlenecks to traffic.

Describe any other roads of importance.

- Railways: Gauge, number of tracks, steam, diesel or electric, and any other remarks on possible use militarily.

- Inland Waterways: Remarks on rivers and canals which may be of value as transportation links. Depths and widths may be described but probably easier to portray on a sketch map

- Line telephones or radio telephone links within the sector. Give brief details

Airfields and Disused Airfields or Strips: Grid. reference, length, width orientation of runways, facilities and state of repair should be given.

Helicopter landing areas may be available almost anywhere in open country in which case only a general note is required, but in wooded or built-up areas, they should be specified in the report taking into account the following notes

Size: The Iroquois has a rotor diameter of 48 ft and overall length of 57 ft. On the ground helicopters should be at least one third rotor diameter apart, or more on rough ground.

Approach: Helicopters can go down into small clearings surrounded by trees, but this reduces their pay load. If possible, approaches should be clear, but scrub up to 10 ft high on the edge of the site is acceptable. A good approach should have no obstructions over 50 ft high within ¼ mile, and none over 200 ft within ½ mile. The top of a hill as a site is preferable to a valley or a shoulder.

Surface: Aircraft should not sink more than 3 ins into the ground. An Iroquois weighs 4 tons. Fine dust, sand or snow will slow up operations but will not stop flying altogether. Very soft surfaces or crusted surfaces with soft layers under create "ground resonance" problems and the pilot should be warned. In long grass there may be a fire hazard from exhaust gases.

Roughness and Slope: Ground clearance of the Iroquois is only 15 ins hence tree stumps and rocks are a hazard. In high temperatures and little wind, a run of about 30 yds may be necessary for take-off. Maximum slope for landing should not exceed 1 in 10 uphill.

Water: Report on water supplies available and, from 'what source, i.e., rivers, bore holes, wells, catchment etc. Rough estimate of quantity available, pumping stations, distillation plants. The quality of water available.

Engineering Materials: A few notes on quarries, timber supplies, gravel which would be useful for ramping and, emergency engineer work.

Engineering Facilities: A few notes on saw mills, workshops and any other facilities in the vicinity which may be of value for engineering work in the early stages of a landing.

Detailed Beach Report (Pro forma)

1. Beach No:

2. Geographical Location or Name:

3. Position: Latitude and. Longitude and G.R. of Limits.

4. Landmarks: Describe any pertinent landmarks which will aid navigation in approaching the beach. (Refer to photo if necessary).

5 Approaches: Describe the immediate approach to the beach.
(See also Sector report).

6 Anchorages: Give information regarding anchoring off the beach.
(See also Sector report)

7. Sea & Surf: Remarks on conditions likely to be experienced indifferent weather conditions. (See also Sector report). (Photos if possible).

8. Tides and Tidal Streams: Give any additional information not covered by the Sector Report.

9. Beach Profiles: Describe beach profiles if no gradient lines have been run. Give information which cannot be deduced from beach diagrams.

10. Dimensions of Beach: Give length between limits and approximate widths at HW and LW if not apparent from large scale map.

11. Nature of Beach: Describe composition of beach, bearing capacity and trafficability under wet and dry conditions if possible. Describe surface features, drains, breakwater, obstructions, small jetties and ramps not worthy of a special report. Supplement with photos. Large scale map, plan or sketch of beach may save a lot of writing and be clearer to grasp

12. Back of Beach and Hinterland: Description of back of beach and. hinterland drawing attention to topographical features likely to affect military operations.
(See also Sector Report).

13. Exits: Describe with photos the exits from the beach for personnel, wheeled and tracked vehicles. Remarks on lateral movement on the beach and inshore of the exits.

14. Communications Inland: Describe routes from exits to Main Coast Road and support with photos. (See also Sector report).

15. Cover from Observation: General remarks on cover from ground forces and from the air in the immediate beach area and hinterland.

16. Water and Engineering: Materials: Give information on availability of water and building materials (stone, timber, gravel) in the beach area. (See Sector report).

17. Helicopter Landing Areas: Give information for areas close to the beach. (See Sector report).

18. Store Dumps and Assembly Areas: Give information about hard or soft standing areas for stores etc. Any covered storage which might be available.

Detailed Beach Report Attachments

After the text described above the following should follow in order:

(a) Folder or beach profile diagrams.

(b) Folder and annotations of photographs (ground).

(c) Folder of air photographs.

(d) Large scale map, plan or sketch of beach, Beach Chart (if available).

Maps and Charts:

1 Index Map

A small-scale map or chart (or portion of) should be included inside the front cover of the report as a convenient reference showing the Sectors for the coast being surveyed. Such a map or chart must contain a scale of Latitude and Longitude.

2 Sector Map/Chart

Maps or Charts on a scale of about 1 in to the mile (1/63,360) covering the whole sector are to be included with the Sector Report. The beach numbers, limits and other landing places in the sector are to be shown on the maps or charts. Additional hinterland information obtained during the survey may be plotted or annotated on the Sector Map if this will clarify or reduce written description.

3 Beach Chart

This is a large-scale map, chart or plan of the beach and immediate hinterland (about 6 ins to one mile) and is included with the detailed beach report. Numbered notes can be made on the beach chart to refer to photographs. Beach obstructions can be plotted on this map or chart. (See also Air Photos).

4 In addition to the above other plans and hydrographic surveys of value covering the 'Sector should be included with the report.

5 Photographs

Beach surveys should be liberally supported by photographs and panoramas.

Photos taken ashore should whenever possible have a man, land rover, or stave, in the picture from which relative sizes can be gauged.

Photos should be mounted as a cascaded pack of cards, with a type written sheet of annotations, facing the photos.

If a photo is required to illustrate a point in the Sector Report as well as in a Beach Report, then it should be placed in the folder for either report and cross reference accordingly. Do not duplicate photos for this purpose.

All Photographs are to be annotated as follows:

No

Date
G.R.

Notes.

The number of the Photograph will be decided as follows:

Sector & Beach No e.g. D/1/9

Spool No e.g. 5

Frame No e.g. 7

Index Letter e.g. B from following table

A - Part of a Pan

B - Beach Point of Interest

C - Hinterland Point of Interest.

The No of the above photograph would be D/1/9-5/7B. It is to be noted that a photograph without words is comparatively useless but with the correct words it will save much work.

Air Photographs: Prints may be annotated in black ink or with typed labels stuck on but when these methods may obliterate other detail an overlay tracing should be prepared. These overlays need only be made once and can be duplicated. Such an overlay can also be used as the large-scale beach chart if no suitable maps or charts exist

It is only necessary to use a few of the air photographs (both vertical and oblique) to illustrate landing beaches which have been written up. As the whole coast will have been photographed the remaining air photographs should be packed in boxes and included with the report suitably indexed.

Types of Photographs Required:

(a) Pan of beach at LW from back of beach.

(b) Pan of back of beach at LW from near L.W.L or offshore.

(c) Pan of coast from offshore.

(d) Pan of hinterland from back of beach if open country.

(e) Photos of exits.

(f) Photos to illustrate special features or landmarks.

(g) Photos of bridges and roads in selected places.

(h) Photos of jetties, ramps and hards.

(i) Vertical air photo of beach. (j) Oblique air photo of beach.

Note: (a) and (b) should be repeated at each profile line if these are not too close together.

Photographs were taken with a polaroid camera which produced prints on the spot. When back on board the photos had to be sealed with a special sealant (very sticky). All members of the Sailors mess were required to help as it was quite a lengthy job.

In general photographs should be mounted in folders and placed in the report where the bulk of them refer to the text at that point.

There is however, no objection to photos being bound in a separate volume as long as they can be readily found while reading the text. This decision depends a great deal on the nature of the report.

If more photos have been taken than are actually necessary to illustrate the report, they should be kept in boxes with a typed annotated list in the report showing that these additional photos are available if necessary.

6. Landing Places Jetties and Ramps

These should be surveyed 'and written up jointly by the Naval and Military officers. Depths alongside, height of deck above M.H.W.S, capacity of cranes, bearing capacity and dimensions are required for jetties.

Slope, width, length, depths at seaward end, and bearing capacity are required for ramps and hards.

Photographs are invaluable.

7. Ports

Major Ports are not included in beach survey work unless specially requested in the briefing.

Minor Ports which are found to be inaccurately charted, or inadequately described either in Admiralty Sailing Directions or in Port Information Sheets, should be reported on. See typical P.I.S (Port Information Sheet) for pro forma.

The Factors Which Cause Tides

Tides are caused by the attractive forces of the sun and moon. Due to its closeness to the earth the effect of the moon is far greater than that of the sun. Therefore, the moon largely controls the time of high and low waters. The relative position of the sun and moon will determine whether the sun's force increases the moon's effect on the tide or decreases its effect.

When the sun and the moon are working together to distort the envelope of water surrounding the earth, they are either in opposition or conjunction and spring tides are the result. When the effects are opposing each other the sun and moon are said to be in quadrature and neap tides result. Opposition occurs with a full moon and conjunction with a new moon as shown in Figure 1.

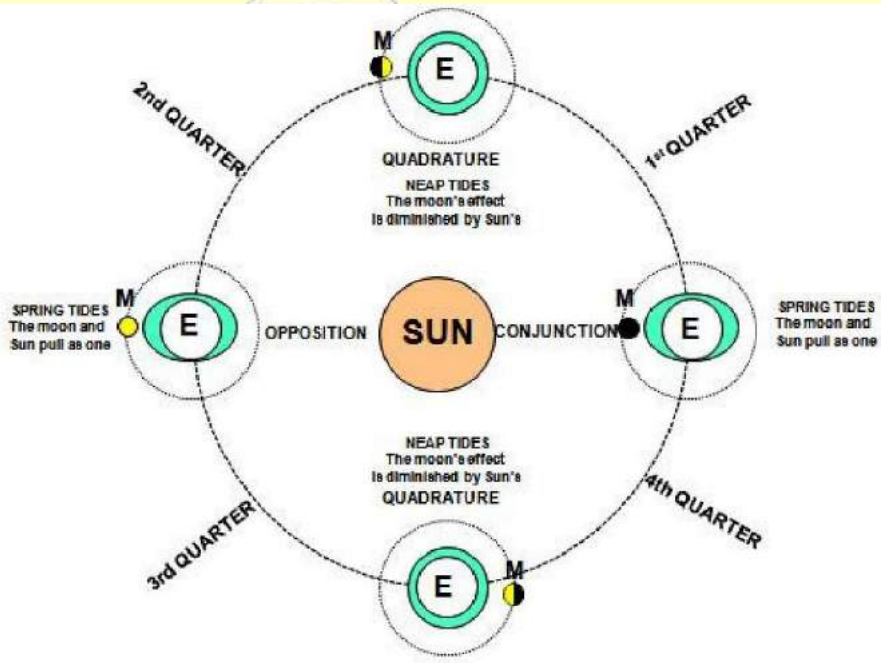


Figure 1: Effect of celestial bodies on tides

The shape of the envelope of water is highly exaggerated in the diagram. In reality the rise and fall of tides in the middle of the oceans is barely noticed. It is only when the movement builds up approaching a coastline that the effect is significant. It can therefore be seen that the shape of the coastline will also have considerable effect on tidal patterns and heights. Shallow funnelling estuaries with low change in depth gradients may develop higher tidal ranges, and areas behind obstructing islands may experience double tides for each side.

Strong onshore winds will tend to hold the tide up, and abnormally low atmospheric pressure will further increase the height of the tide. When both of these meteorological

effects occur together, as they may do with a tropical cyclone, the effects from storm surge and flooding can be devastating.

Tides and Chart Datum

Due to the complexity of the cause of tides, tidal predictions are based on the most frequent set of conditions. They are related to a standard level called Chart Datum. Chart Datum is selected at a level below which the tide will seldom fall. Older Australian Charts used the chart datum of the mean of the lower low water springs (MLLWS). Since there were still a considerable number of occasions when tidal heights fell below this level, charts are now produced with the datum of Lowest Astronomical Tide (LAT), being the lowest the tide that can be predicted due to the effects of celestial bodies' gravitational attraction under average meteorological conditions.

Soundings on charts are given below Chart Datum. Drying heights of rocks and banks are given above Chart Datum. Heights of land and land-based structures on charts are expressed as above Mean High Water Springs. See Figure 2 for the various levels.

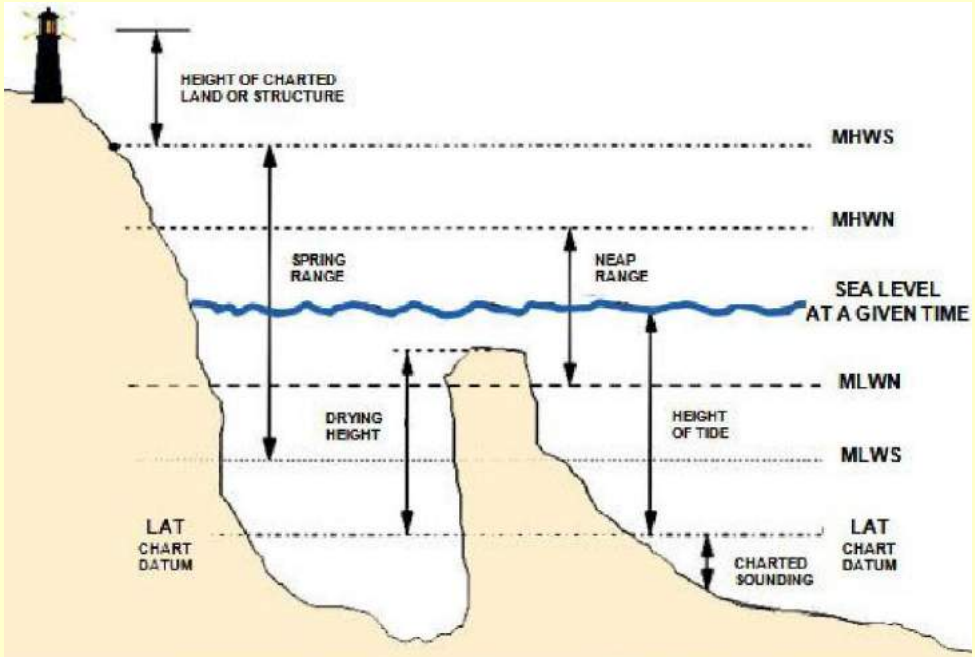


Figure 2. Tides and Chart Datum

The heights of High and Low water on tide tables are the heights of water above the chart datum.

- Range of Tide is the difference in height between Low and High Water.
- The Duration of Tide is the time interval between successive High Waters.
- The Duration of Rise (flow) is the time interval from Low Water to High Water.
- The Duration of Fall (ebb) is the time interval from High Water to Low Water.

Notice that mean sea level is not constant throughout the year. Seasonal variations may have an amplitude of up to 0.4 metres but generally is in the order of 0.1 metres for Australian ports.

Basic Tide Tables

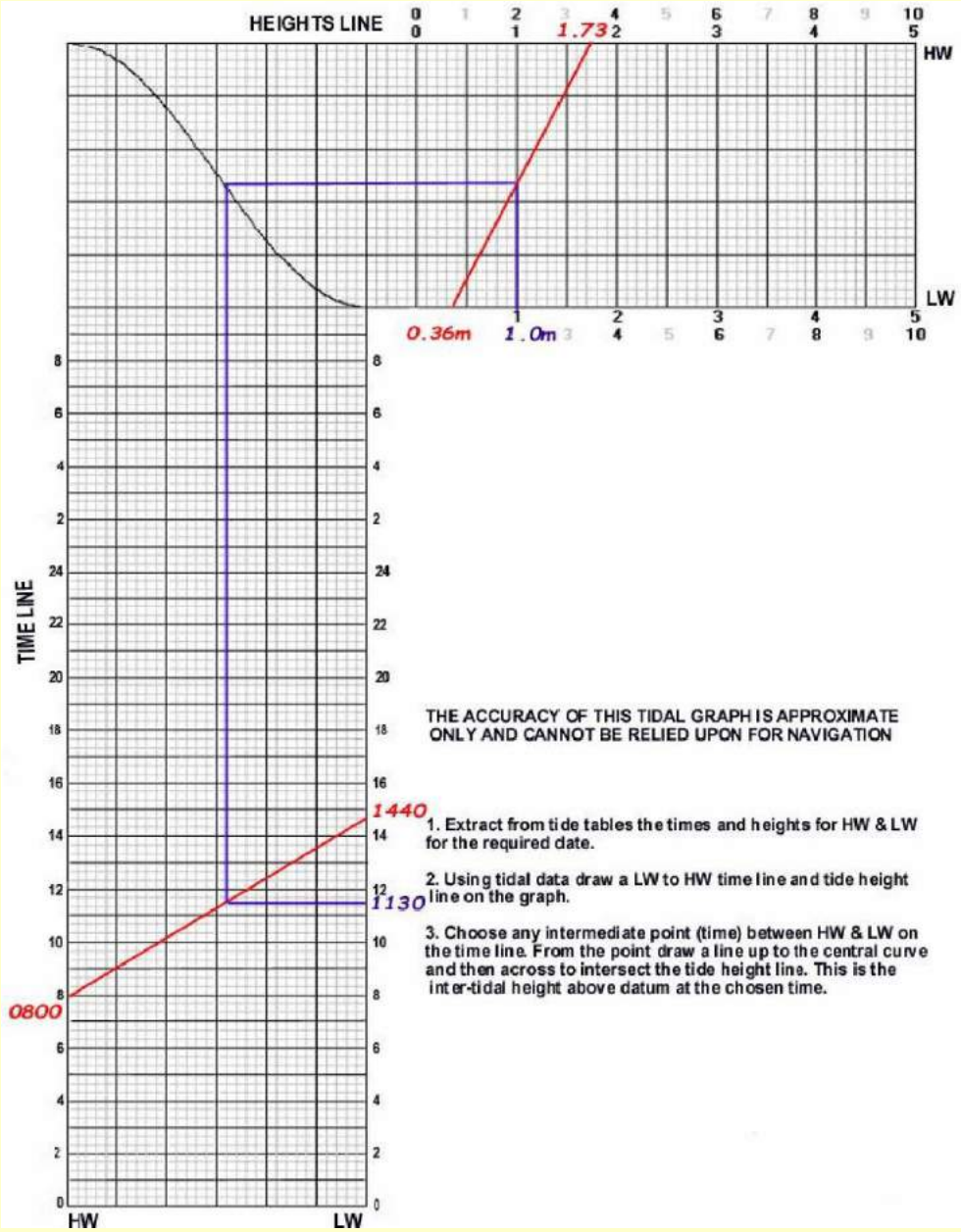
Many versions of tide tables are available in print and on the internet. Below are detailed the extraction of times and heights of high and low water for a Standard Port from an NSW Maritime (RMS) tide chart for Friday 28th December 2012.

1.43				WAGONGA INLET		
	28	0128	0.50	Narooma	54 min	30 min
		0800	1.73			
	FR	1439	0.36	MORUYA RIVER		
		2032	1.30	Moruya	45 min	45 min
0.40	29			BATEMANS BAY	NIL	NIL
1.70		0536	1.75			
0.32	SA	1514	0.34	CLYDE RIVER		
		2109	1.32	Bridge	15 min	15 min
1.39	30	0244	0.48			
0.57		0913	1.75			
1.54	SU	1546	0.33	ULLADULLA	NIL	NIL
0.40		2146	1.33			

Example 1: Find the time and height of low water at Clyde Bridge on Friday 28th December 2012. Note that the times stated are Zone time (UTC). In NSW summertime daylight saving is in force between October and April so a local time is correction by adding one hour is necessary in December. Therefore, high water local (daylight saving) time of is 0800 +10 hr =1800 + 15 min=18:15 (EST) + 1 hour = 19:15(EDST). The yellow ball indicates that it is the time of the full moon in when spring tides are reaching their maximum.

Intertidal Heights and Times

The tide height at a specific time will often be needed to ensure safe entry over a shoal patch or to anticipate how much rope is required to anchor. The simplest (and least accurate) way of estimating this is to make an assumption that the height and duration of tidal flow follows a sine curve. Clearly it will be wise not to rely on the estimates calculated, and to allow additional clearance for the vessel as circumstances require.



Find the time and height of 1.0m over LAT at Sydney on 28th December 2012. Note - this calculation assumes the sine curve ideal of tidal flow, unlikely to be matched in reality so additional clearance should be allowed for.

Standard and Secondary Ports

In order to provide tidal information for the hundreds of ports the Australian National Tide Tables (ANTT) provide detailed daily predictions for Standard (large) ports and tables to calculate the difference at a Secondary (smaller) port. The Standard Port acts as a reference station where predictions are based on continuous observation and contain changes in conditions due to meteorological conditions.

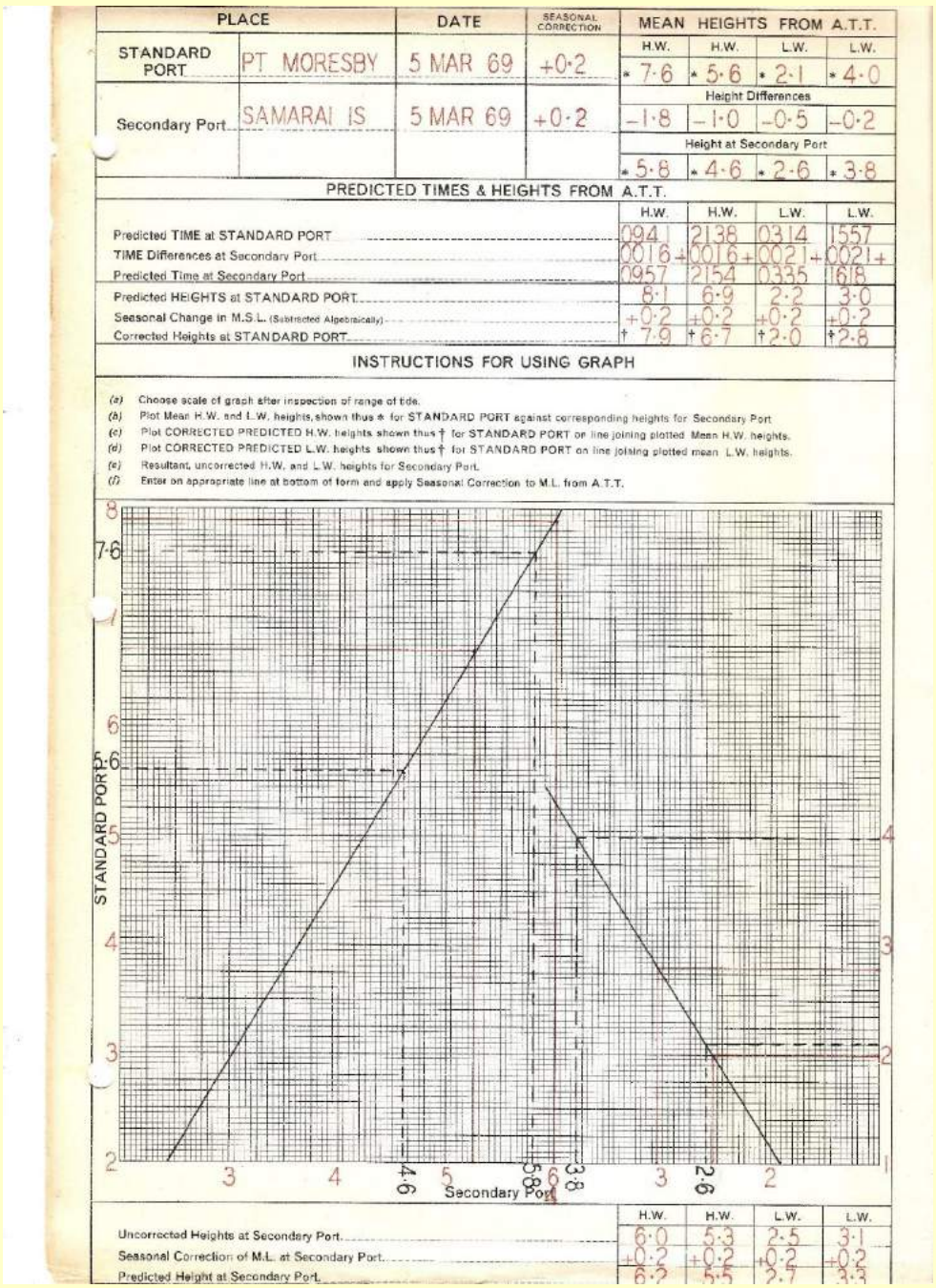
The information given in the ANNT for each standard port is the predicted times and heights of high and low water. Secondary Ports or Subordinate stations are based as near as practicable on Standard Port tidal characteristics in the area. The predictions for tidal times and heights for secondary ports are made by the application of time and height differences to the standard port.

Calculations Involving a Standard and Secondary Port

While all tides are composed of both diurnal (once a day) and semi-diurnal (twice a day) components, the ANTT lists in Table 1-Tidal Levels of Standard Ports as either Part 1 - Predominantly diurnal tides or Part 2 - Predominantly semi-diurnal tides

Diurnal tides - A diurnal tide has one high water (tide) and one low water (tide) per day. Typically, with a diurnal tide each successive high or low tide is 24 hours and 50 minutes apart, this is the length of one lunar day.

Semi-diurnal tides - A semi-diurnal tide occurs when there are two high waters (tides) and two low waters (tides) per day. Typically, the time between each successive high or low tide is 12 hours 25 minutes, this is half of one lunar day.



PLACE		DATE	SEASONAL CORRECTION	MEAN HEIGHTS FROM A.T.T.			
				H.W.	H.W.	L.W.	L.W.
STANDARD PORT	PT MORESBY	5 MAR 69	+0·2	* 7·6	* 5·6	* 2·1	* 4·0
				Height Differences			
Secondary Port	SAMARAI IS	5 MAR 69	+0·2	−1·8	−1·0	−0·5	−0·2
				Height at Secondary Port			
				* 5·8	* 4·6	* 2·6	* 3·8

PREDICTED TIMES & HEIGHTS FROM A.T.T.

	H.W.	H.W.	L.W.	L.W.
Predicted TIME at STANDARD PORT	0941	2138	0314	1557
TIME Differences at Secondary Port	0016 +	0016 +	0021 +	0021 +
Predicted Time at Secondary Port	0957	2154	0335	1618
Predicted HEIGHTS at STANDARD PORT	8·1	6·9	2·2	3·0
Seasonal Change in M.S.L. (Subtracted Algebraically)	+0·2	+0·2	+0·2	+0·2
Corrected Heights at STANDARD PORT	† 7·9	† 6·7	† 2·0	† 2·8

INSTRUCTIONS FOR USING GRAPH

(a) Choose scale of graph after inspection of range of tide.
(b) Plot Mean H.W. and L.W. heights, shown thus * for STANDARD PORT against corresponding heights for Secondary Port
(c) Plot CORRECTED PREDICTED H.W. heights shown thus † for STANDARD PORT on line joining plotted Mean H.W. heights.
(d) Plot CORRECTED PREDICTED L.W. heights shown thus † for STANDARD PORT on line joining plotted mean L.W. heights.
(e) Resultant, uncorrected H.W. and L.W. heights for Secondary Port.
(f) Enter on appropriate line at bottom of form and apply Seasonal Correction to M.L. from A.T.T.

	H.W.	H.W.	L.W.	L.W.
Uncorrected Heights at Secondary Port	6·0	5·3	2·5	3·1
Seasonal Correction of M.L. at Secondary Port	+0·2	+0·2	+0·2	+0·2
Predicted Height at Secondary Port	6·2	5·5	2·7	3·3

Example calculation of HW and LW at a Secondary Port

Tidal Work

For the work done on beaches involving tidal corrections, it is important that as good a datum as possible is established commensurate with the time and personnel available to obtain the tide readings. It should be remembered that whenever beach survey intelligence is used operationally the depths being predicted for landing purposes will usually be fairly critical and the original survey work needs to be reliable.

The following methods should be used for obtaining tidal reductions and datum:

- Predicted tidal curves can be plotted for the date and place from the information and methods given in Tide Tables. In some cases, it may be advisable to compute predictions for places either side of the area being worked and interpolate.
- Use observed tidal readings from an established gauge and correct them for time and height differences tabulated in Tide Tables. Automatic gauges at ports must be levelled to or checked by direct measurement to a known point above datum.
- Erect a local tide pole and establish datum on it as follows:
    - observe the times and heights of H.W and L.W. Where there is a large diurnal inequality in tidal heights efforts should be made to read the highest H.W. and the lowest L.W of the day'
    - or read the pole every hour for 25 hours continuously, so as to get the greatest range for the day.

If a tide pole is erected it should always be connected by levelling to some reference point on stable ground. If land survey bench marks are available connect to these, otherwise select some point on a stone building, jetty or even cut a mark on a rock. Tidal datum established can then always be recovered at a later date if required. Should considerable time and effort have been expended in establishing datum it is as well to level to at least two reference points in case one is destroyed.

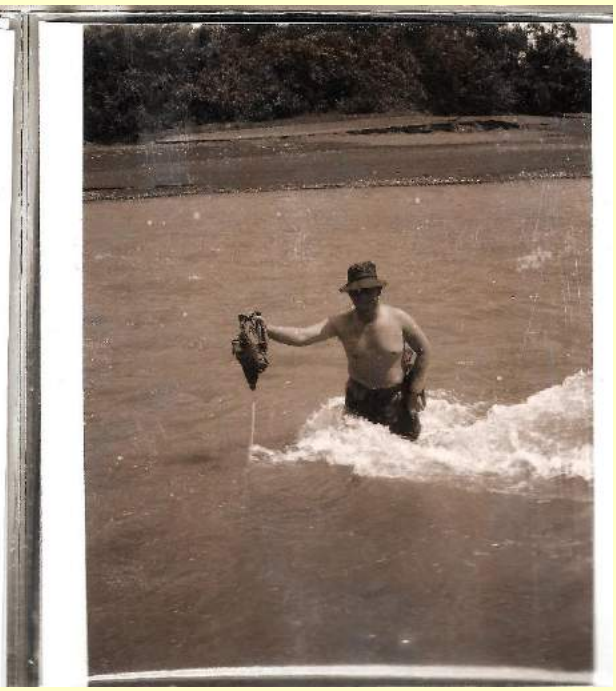
General Beach Survey Procedure

The general procedure at a beach was for the Divers, Survey Recorder and Cpl to perform a profile survey at the centre line of the beach, out to 3 fathoms, using an echo sounder with positioning by sextant using a fixed short base line. The profile of the back of the beach was determined by level. The divers would examine any known or clearly visible under water obstructions and examine the nature of the seabed out to 3 fathoms. The surveyors reduced the raw depths to chart datum using predicted tides. They also transferred high and low water heights from the nearest standard port to the local area. The beach profile is critical as it shows whether or not a certain vessel can land at a particular state of the tide without breaching. In a few cases tidal observations were taken to supplement existing tidal data. The mouth of the Sepik River was one location.

I worked with the photographer and examined the back of the beach for suitable exits and examined the hinterland for roads and infrastructure and obstacles to movement. Many Polaroid photos were taken of such things as extremities of beach, panorama of beach, exits, roads, bridges, vegetation types, landing strips, jetties, landing hards, local plant and equipment, infrastructure (ware houses, hospitals, workshops, accommodation buildings, power generators etc), hard standing areas, obstacles. We sometimes had use of the beach buggy to transport us along the beach, if it was going and we could get it ashore in the boat through the surf. Some beaches were quite long and there was often a fair journey to the next beach for the day. Mostly though, we had to hoof it.

Topphoto: Going back to the Ship at Wewak. Ray Cox and myself.

Bottom photo: The beach buggy.



Quenching my thirst with coconut juice. Crossing a river

Native Tree House

Native village. Sand swept daily with home-made broom. Most coastal villages were kept clean and tidy

I marked up details of the beach on air photos: extremities, length, width, exits, roads etc. I also wrote up most of the final report. A report was also required for each sector. This report contained information about the general suitability of the sector for landings (weather, tides, sea, swell, surf, anchorages, approaches, communications, hinterland) and included details of medical services, missions, local populations and resources available (food supplies, water, timber, stone and gravel). Detailed reports were also required for all ports. There was a list to requirements to be examined and photographed.

We did not have the expertise or resources to complete a full beach survey as per the established doctrine. This would have required an engineer officer and some transport experts plus some equipment to test the bearing capacity for various types of vehicles. We did take a lot of samples of beach material for later testing, and sometimes dug holes in the beach to 24in to see its composition.

Digging a hole to see substrata at Kairiru Island. Me and Ray Cox

HMAS Madang

HMAS Madang in TPNG

HMAS Madang in Sydney, shortly after Commissioning

Builder	Evans Deakin and Company
Launched	10 October 1968
Commissioned	28 November 1968
Decommissioned	14 November 1974
Motto	"Our Ship Your Shield"
Fate	Transferred to Papua New Guinea Decommissioned November 1989
Badge	

al characteristics	
Class and type	*Attack* class patrol boat
Displacement	•100 tons standard •146 tons full load
Length	107.6 ft (32.8 m) length overall
Beam	20 ft (6.1 m)
Draught	•6.4 ft (2.0 m) at standard load •7.3 ft (2.2 m) at full load
Propulsion	•2 × 16-cylinder Paxman YJCM diesel engines •3,460 shp (2,580 kW) •2 shafts
Speed	24 knots (44 km/h; 28 mph)
Range	1,200 nautical miles (2,200 km; 1,400 mi) at 13 knots (24 km/h; 15 mph)
Complement	3 officers, 16 sailors
Armament	• The 40/60 Bofor gun was removed and in place we had two 17ft De-Havilland boats and a beach buggy. • 2 × .50 calibre M2 Browning machine guns • Small arms

Crew: Two Officers and 15 Seamen plus one Army Officer and Army Cpl.

Captain: LEUT (Clearance Diver) LCDR Terry Jones/ LEUT Ken Heynatz

XO: LEUT (Clearance Diver) LEUT Clive Carlyn/ LEUT Sid Brown

Coxswain: CPO Fowler

CPO Engine Room Artificer: “Rocky”

PO Mech: Unk

PO Survey Recorder: Unk/Cooper

Radio Operator: Turvey

Cook: Unk

AB Phot: Unk/Fred

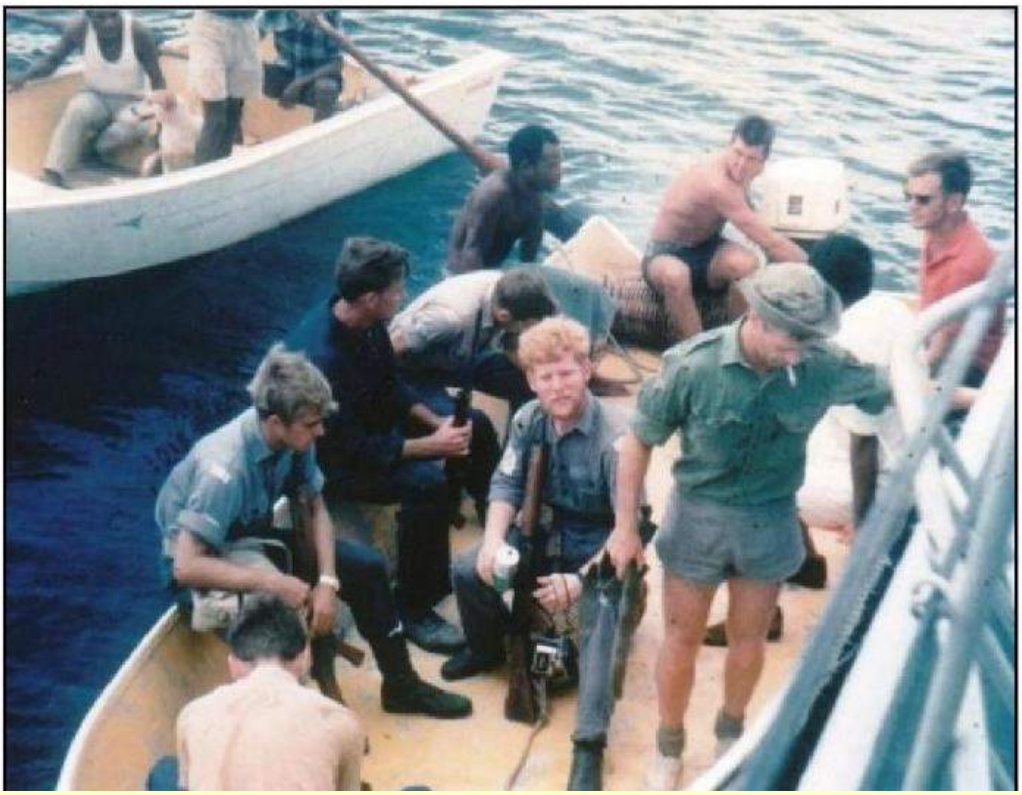
AB Clearance Diver: McKenzie, Ray Cox

AB Quartermaster Gunner: Sorenson, Butch

4 Stokers (in the engine room). I only remember Spike Jones

Lowering 40 HP Johnson outboard into boat

Cooper, Fred, UNK, Heynatz, Cullen & McKenzie



Top photo: Jock Kay, Fred, Butch

Bottom photo: L-R AB Sorenson, CPO Tiffy "Rocky" Jim Cullen, Ray Cox (driver), Jock Kay (cigarette in mouth) Lieut Ken Heynatz with boarding party Milne Bay

Army Pers

The first army team in 1969 was Capt Jim Bownds and Cpl Jock Kay, Followed by Lt Charlie Watson and Cpl R (Chuck) Cooper. In 1970 there was Jim and Jock, followed by Capt

Charlie Watson and Cpl Chris Dalhberg, then 2 Lt Ian Shepherd and Cpl John Dean. I don't know who participated after that as I was in Vietnam in 1971. The survey was completed (D'Entrecasteaux Group of Islands) in 1975, using Landing Craft Heavy (LCH) L131 HMAS/PNGS Salamaua commanded by LEUT Bob Willis (later Commodore, RAN Hydrographer). Peter Jensen was on that Survey and wrote an article - Operation Beachcomber 1975 – in this newsletter No 1/12 of January 2012 http://www.rasurvey.org/actindex.html

The Beach Survey Team

The Survey team consisted of a Naval Officer (Clearance Diver), Army officer (RA Svy), Survey Recorder (RAN), Cpl (RA SVY), AB(PHOT) and a couple of Clearance divers/boatmen

Life on board Ship

There was not much space on a small ship. I shared a cabin with the XO. There was only room for one person to stand on the floor. Sleeping berths were either two or three tier bunks. I did most of my paper work at the chartroom table when we were not sailing. When we were sailing there was not much to do either walk around or read in your bunk. In rough weather it was most uncomfortable. There was always rough weather sailing through Vitiaz Strait between mainland PNG and the Island of New Britain. Going ashore in the morning to do a survey usually meant a dunking in the sea, then walking all day in wet clothes and boots. We were issued with green canvas "Jungle Boots". However, I soon acquired a pair of navy sandals, which were more comfortable. There was no TV, but most people had a radio and/or cassette tape player. The food was pretty good; however, it was mostly frozen at some stage of its life. Alcohol was duty free.

The areas that we worked

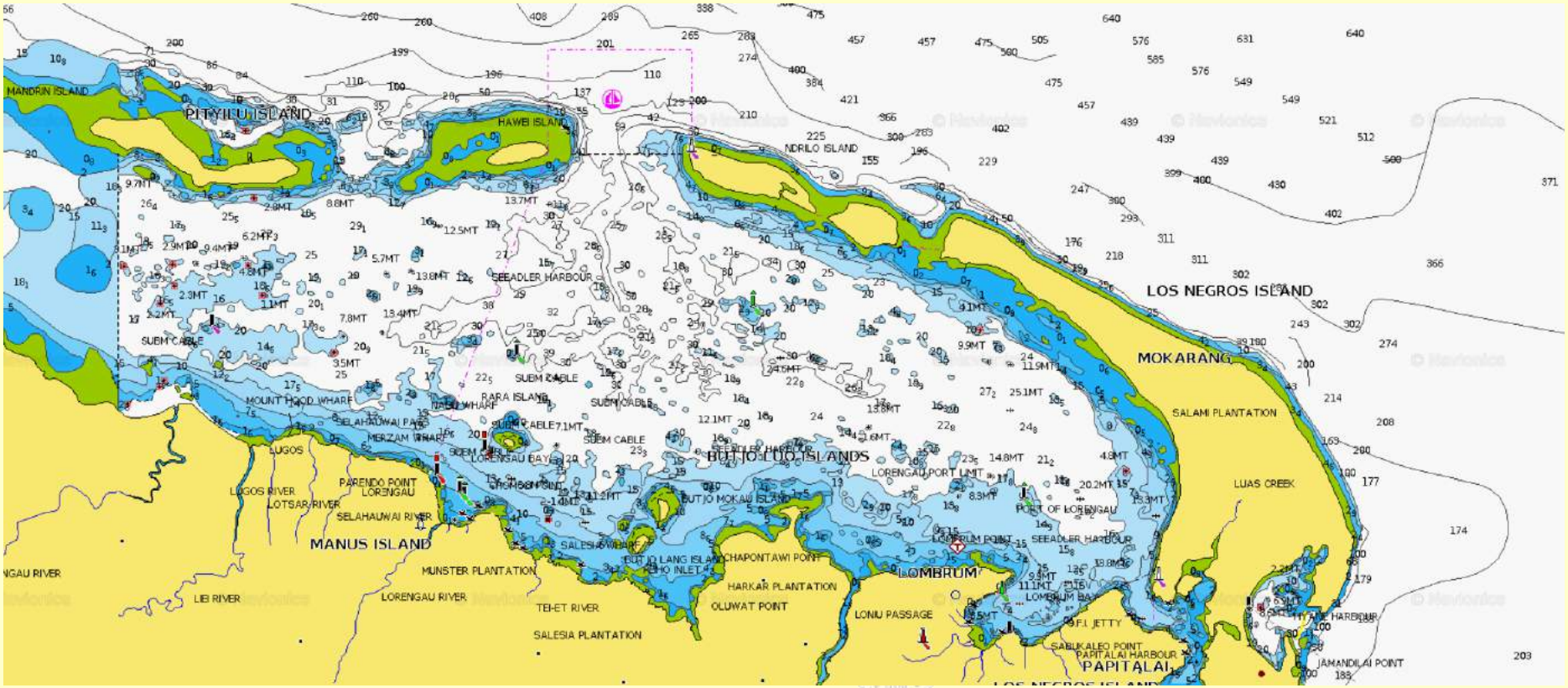
Jim Bownds started at the boundary with Indonesia at Wutung and finished near Aitape. The US Forces did a big (unopposed) landing at Aitape in WW2 to capture the several airfields nearby. Australian forces took over after the US moved further north. I started at Aitape and finished about Bogia in 1969. In the second year (1970) Jim worked the south coast around Daru and Milne Bay as the weather was not suitable on the North Coast. I worked from Bogia to Saidor. Saidor was also the scene of a big US Landing in WW2.

Ports

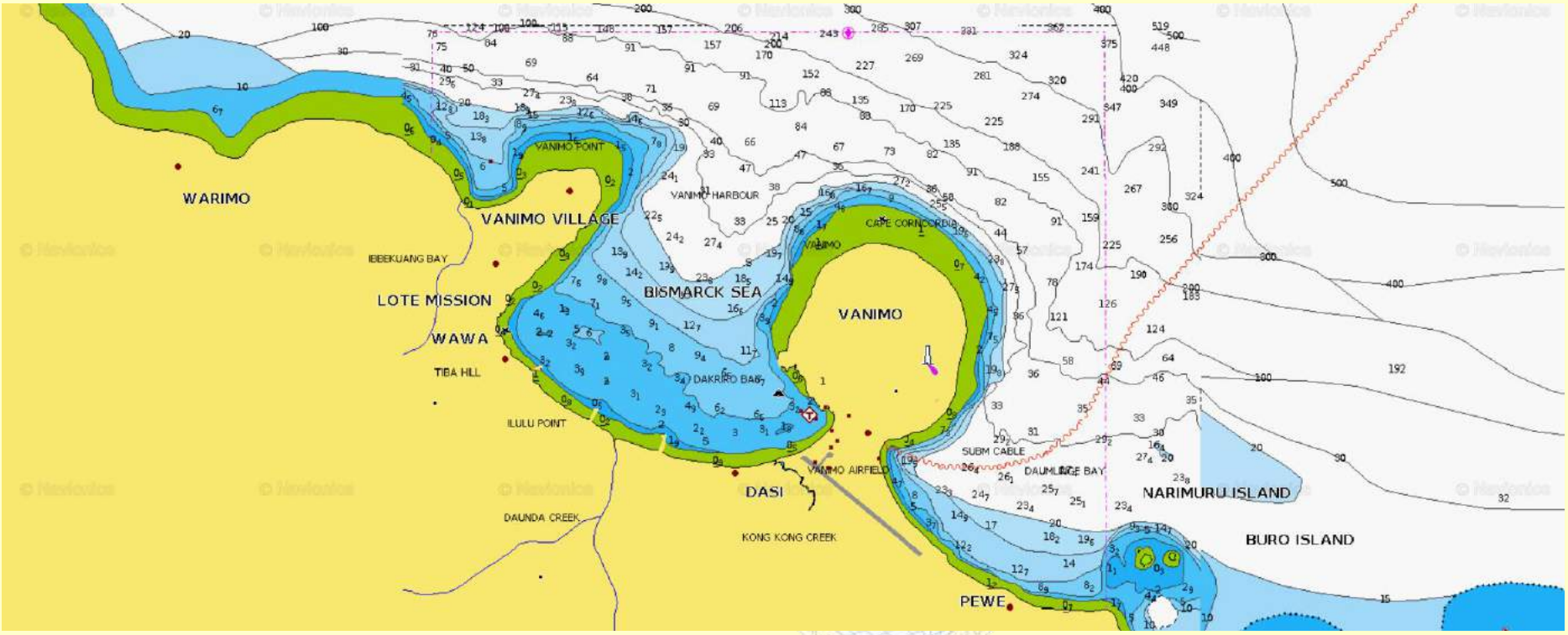
The chartlets below show the major ports that we used. Occasionally we would go to Rabual or Lae for some special purpose. Some of the berths shown on the chartlets below did not exist during the survey.

At Alexishafen: just North of Madang. The Clearance divers defused some UXO here. We were often called upon to defuse or destroy UXO's

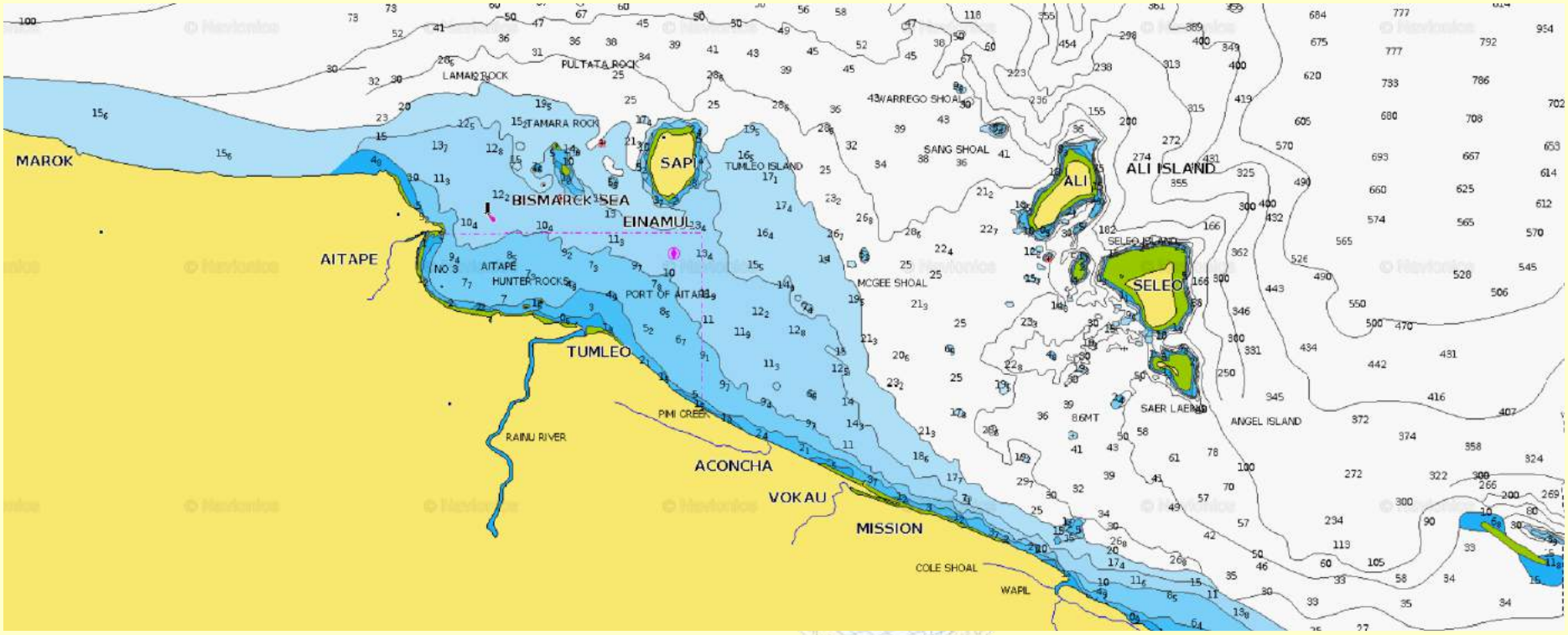

PAPUA NEW GUINEA
0 km 62.5 125 187.5 250 km
GEOATLAS® - © 2000 Graphi-Ogre
EQUATOR
Team 1
1969
Team 2
1969
Team 2
1970
Team 1
1970
MANUS
Admiralty Islands
Manus
Lorengau
Mussau Islands
Mussau
NEW IRELAND
Kavieng
Konos
Namatanai
SOUTH PACIFIC OCEAN
New Guinea
Vanimo
Sissano
Aitape
WESTERN
Dagua
Wewak
Marienberg
Angoram
Bogia
Green River
Ambunti
EASTERN SEPIK
SEPIK
Bismarck
BISMARK SEA
Archipelago
Karkar
MADANG
Madang
Astrolabe Bay
Long Island
Umboi
Rabaul
Kerawat
Kokopo
Talasea
Hoskins
Pomio
Kimbe
Wasum
Kandrian
New Britain
EASTERN NEW BRITAIN
WESTERN NEW BRITAIN
NORTHERN SOLOMON
Buka
Bougainville
Kieta
Arawa
Buin
SOLOMON SILANDS
SOLOMON SEA
INDONESIA
Telefomin
ENGA
Baiyer River
Wabag
Laiagam
Mount Hagen
WESTERN HIGHLANDS
Tari
Mendi
Kiunga
Lake Murray
SOUTHERN HIGHLANDS
CHIMBU
Goroka
Kainantu
EASTERN HIGHLANDS
Nadzab
Lae
Finschhafen
Mumeng
Huon Gulf
Bulolo
MOROBE
Wau
Morobe
Garaina
GULF
Kikori
Baimuru
WEST
Balimo
Merauke
Moreahead
Daru
Gulf of Papua
Kerema
Ioma
Tapini
Bereina
NORTH
Popondetta
Kokoda
Tufi
PORT MORESBY
Sogeri
Kwikila
Abau
CENTRE
Alotau
MILNE BAY
Woodlark
d'Entrecasteaux Is.
Louisiade Archipelago
AUSTRALIA
Gulf of Carpentaria
Bamaga
Great Barrier Reef
CORAL SEA



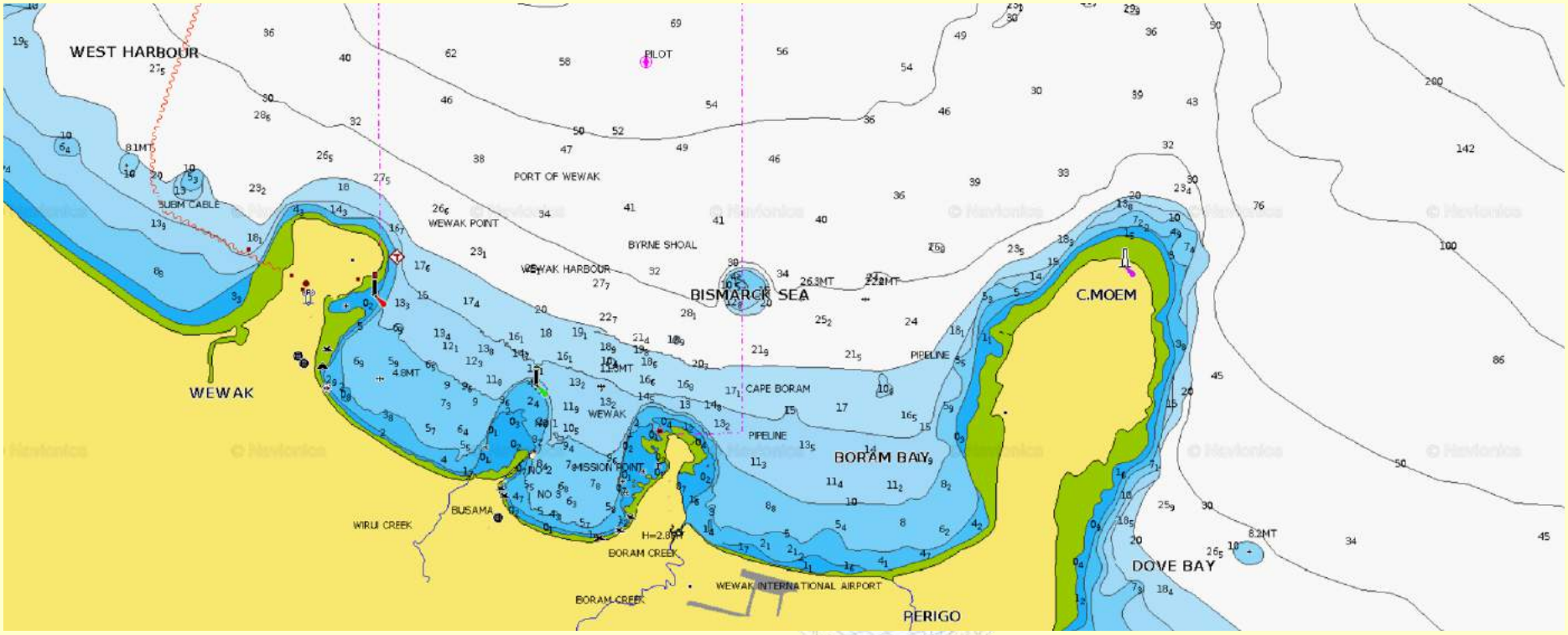
Seeadler Harbour and approaches to Lombrum. Depths in meters. As you pass Hawei Island at the entrance several stranded hulks remind you to go with care.



There was a jetty at Vanimo that we could berth alongside, however, others also wanted to use the jetty so we were often moved about.



There was no Jetty at Aitape so we had to anchor off. Sometimes we would seek shelter behind one of the islands



At Wewak there was only a small jetty not deep enough for Madang to berth. At anchor the ship would roll up to 40 degrees each way as there was no shelter from the prevailing seas.

Madang Harbour. Very short entry and deep water. Several berths for large and small vessels

HMAS Lombrum

HMAS Lombrum was situated on Los Negros Island which was separated from Manus Is by a channel only about 100 yards wide. This channel was filled with old rusted small landing craft. Los Negros was the area of the US Landings on Manus and the scene of some bitter fighting. The wartime harbour off Manus Is was named Seeadler Harbour. It was very large and was swept to about 50 feet by a wire sweep. The Philippines invasion fleet gathered there. It also had extensive naval repair facilities including large floating docks. There were several large airfields on Los Negros which were only visible on the ground by the PSP matting under the vegetation. The current commercial airfield named Momote is also on Los Negros. Significantly most of the Manus Is was defoliated with chemical sprays in WW2. This was supposed to have killed all of the snakes but I can assure you that there are many big ones that survived.

The base commander at Lombrum was CMDR George Halley. The XO was LCDR Boyd Fegan. LEUT McInnes was the Captains Secretary LEUT Frank Gunst was the electrical engineer. There were two nurses at a time. Robyn Kingston was one. I can't remember the names of the others. There was a civilian school teacher and a RAN education officer. There were many others that I did not know. The patrol boat squadron comprised four attack class patrol boats, HMASs' Aitape, Lae, Ladava and Madang. Madang was only nominally part of the squadron as it was tasked for beach surveys (under command for local administration). On completion of the beach surveys, it was to become part of the squadron. The senior CO was LCDR Sam Batemen HMAS Aitape. LEUT Ken Flindal was CO HMAS LAE and LCDR (CD) Terry Jones was CO HMAS Madang. I can't remember who was the CO of HMAS Ladava, except that he was an older chap. Sam Bateman became a CDRE and commanded the Naval Studies Centre in Canberra for some time. I have met him quite often in Canberra. In his early career he did some recce surveys on HMAS Banks around Darwin and Van Diemen's Gulf. Ken Flindal went into computers and I have met him a couple of times in Defence although he lives in WA. Terry Jones was the manager of the maritime museum at Darling Harbour in Sydney for many years. Ken Heynatz, the later commander of Madang was last reported missing on his yacht off the coast of Madagascar.

Lombrum was also the site of a SECOR tracking station operated by the Royal Engineers. RA Svy also operated some satellite tracking operations from this site in later years.

Sources

Australia's Military Map-makers by CD Coulthard-Clarke

Notes for Beach Survey Teams by Captain J W Bownds Special Projects Section AHQ Survey Regt

Notes for Beach Survey Teams JIB

Australian National Tide Tables. Australian Hydrographic Office

NSW Maritime (RMS) tide chart

https://webapp.navionics.com/#boating@8&key=bqdL%7Dgka%5B

Beach Survey Team 2: Diary 1969

Queensland Bulletin No 44 April 2011

Queensland Bulletin No 45 June 2011

A family of service to the nation

Editor: Information from Norm McMurtrie

For more than a decade Norm has been researching his extended family history, many families being in the Central Victorian region. 183 members of Norm's extended family, of 44 families, served in the armed forces during the two World Wars. Of these, 21 paid the ultimate sacrifice.

In doing this work Norm realised the enormous effect that service has on families especially of those who die, but also of those who return. He also realised that unfortunately much has not been understood or even told about the lives, the values, the hopes and the fears of those wartime generations, especially what they sacrificed for their descendant generations.

> *It is the soldier, not the minister, who has given us freedom of religion.*
>
> *It is the soldier, not the reporter, who has given us freedom of the press.*
>
> *It is the soldier, not the lawyer, who has given us the right to a fair trial.*
>
> *It is the soldier, not the politician, who has given us the right to vote.*
>
> *It is the soldier who salutes the flag, who serves beneath the flag and whose coffin is draped by the flag, who allows the protester to burn the flag*

(Reportedly written by Charles M Province, 2009)

Our Association Calendar 2022/2023 – the fridge magnet

Thurs 8th December 2022	Christmas Happy-Hour – The Duxton Bar and Restaurant, O'Connor shops at 5pm
Tues 25th April 2023	Anzac Day service and lunch
Sat 1st July 2023	108th Corps birthday lunch
Sat 11th November 2023	Remembrance Day lunch