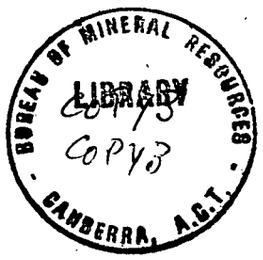
COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS

1964/163



ANNUAL SUMMARY OF ACTIVITIES - 1964
ENGINEERING GEOLOGY AND MISCELLANEOUS INVESTIGATIONS.

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Engineering Geology, Miscellaneous Investigations and Geological Mapping and Map compilation Groups, Geological Branch, Bureau of Mineral Resources

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Engineering Geology, Miscellaneous Investigations and Geological Mapping and Map compilation Groups. Geological Branch, Bureau of Mineral Resources

INTRODUCTION

The work of these groups includes both field investigations and office-based work. The field work consists of engineering geology for both major construction projects and urban services in the Commonwealth Territories, geohydrology and the search for phosphate.

Some of the work connected with the A.C.T. extends into nearby parts of New South Wales and some consulting services have been provided for the Commonwealth Department of Works in Melbourne and Adelaide. Matters connected with underground, and aspects of surface, water in and around the A.C.T. are also dealt with by these sub-groups. Engineering geology investigations in the Northern Territory and Papua - New Guinea are generally carried out in association with, or by, the Resident Geological staff in the Territories. Technical supervision is provided from the Engineering Geology group in Canberra when the investigation is carried out by Resident Staff. Reports on engineering, groundwater and miscellaneous investigations in the Territory are generally edited by the sub-section. Office work includes map editing, compilation of special, generally, small-scale, maps, the maintenance of a register of Australian stratigraphic names and preparation for publication of stratigraphic lexicons.

During 1964 accommodation and furniture requirements in the new Bureau building and staff matters have taken up some time.

The following geologists worked in Dr. Carter's sub-section during 1964. All but the last two names were working in the sub-section at 31st October:

E.K. Carter	Geologist	Class IV	
D.E. Gardner	Geologist	Class III	- Engineering
G.M. Burton	Geologist	Class III	- Map Editing, Completion, A.C.T. Groundwater.
E.G. Wilson	Geologist	Class I	- A.C.T. Groundwater and Engineering. Map Editing and Compilation.
J.K. Hill	Geologist	Class I	- Engineering
E.J. Best	Geologist	Class I	- Engineering
Miss C. Mitchell	Geologist	Class I	- Stratigraphic Indexing
D.F. Maggs	Geologist	Class I	- Engineering
J.R.L. Read	Geologist	Class I	- Engineering
Miss B.K. Graham	Geologist	Class II	- Map Compilation
W. Oldershaw	Geologist	Class II	- Engineering

The following geologists were combined in the phosphate groups under Mr. Noake's direction during 1964, although their investigations were supervised by other sections in previous years; P.W. Pritchard, Geologist Class 2, J. Barrie, Geologist Class 1, and J.A. Kaulback, Geologist Class 1. Colombo Plan Fellows Narajana and Sundararamayya spent periods with the groundwater group.

Three, and for much of the year four, field assistants were also employed in engineering geology and miscellaneous investigations.

Two students worked in the sub-section during part of the 1964 University summer vacation.

ENGINEERING GEOLOGY

During the year a Dynametric seismic timer became available for use in engineering geology investigations in the A.C.T. and has proved a very useful tool. Use of the instrument and interpretation of results has, however, meant extra work for the engineering geology group.

Other new developments during the year included a revision of the format of the drill log sheets and presentation of new data; sluicing was used for the first time as an aid to geological mapping; and as a result of experiments a correction for friction loss at packers can now be applied to drill hole water-pressure tests.

Further attempts have been made to have a system of instrumentation established to determine seismic response characteristics of various potential foundations in earthquake-prone parts of Papua-New Guinea. Discussions are still in progress.

A.C.T. AND ENVIRONS

Engineering Construction Projects

Corin Damsite (Damsite E), Upper Cotter River. Detailed feasibility and design investigations proceeded through much of the year. A total of about 3000 feet of drilling was done, large parts of the foundation area were stripped by bulldozer, and sluicing of part of the foundation area is in progress. All exposed areas were geologically mapped by geologists of the section, drill core was logged and holes water-pressure tested. The storage area was mapped and a special study made of the Cotter Fault and other possible leakage paths. Spillway areas were tested by seismic timer and contract seismic surveys, and sources of construction material (other than earth materials) were examined. Earth materials were investigated by Department of Works Officers.

Corin Dam is to be roughly 220 feet high; Foundation conditions have proved to be better than the early feasibility studies had suggested. The site is unsuitable for a simple arch structure but is suitable for a variety of multiple buttress concrete dam designs, for a gravity concrete dam or an earth or rock-fill dam. It has been decided that an earth-cored, rolled rock fil dam will be built.

Bendora Dam Upper Cotter River. A completion report is nearly finished. In it all data bearing on the foundation and abutment strength and water tightness have been brought together, and an analysis has been made of the relationship between joint permeability, as revealed by water-pressure tests, and cement grout consumption.

Bendora Dam to Cotter Pumping Station Water Supply Line

Parts of the route of the proposed pipeline have been mapped in order to assess the likely excavation conditions. Some rerouting has been recommended and adopted. The preliminary mapping is still in progress; it is to be followed, before construction, by seismic probing and augering.

The excavation conditions for a pipeline to Mount Stromlo reservoir were determined by the use of a seismic timer and geological mapping.

Other Damsites Brief inspections were made of possible damsites on the Cotter and Queanbeyan Rivers. The site on the Cotter River is about one mile upstream of Vanity's Crossing and appears suitable, for a structure at least 300 feet high. It is on dacitic tuff, in a highly faulted area. The site on the Queanbeyan River is just below the confluence with Balinafad Creek and is in highly faulted interbedded shale and impure sandstone. The profile and probable depth of weathering make the site suitable for only a low dam of less than 100 feet high.

Building Foundations. Services were provided on the following building sites:

National Library, Parkes - foundations mapped and advice given on drainage.

Defence Building, Russell Hill - advice given.

Bureau of Mineral Resources, Parkes - foundations mapped.

Economics Building, A.N.U., Acton - advice given on groundwater conditions.

Secretariat Building, Blocks D, E and F, Parkes - exploration drilling planned and arrangements made for seismic testing by Geophysical Branch.

Woden Development. Areas 3, 5, 6, 7 and 8 were geologically mapped and information was provided on foundation, excavation and drainage conditions. Augering for design of engineering services in several of the areas was designed and the holes were logged. Drill holes for the Yarralumla Creek expressway were logged and trenches in the suburbs of Curtin and Lyons were mapped.

Belconnen Development. Areas 6 and 7 were mapped, augering for engineering services w planned and the holes logged. A report is being prepared.

Capital Hill, Canberra City District. At the request of the National Capital Development Commission a comprehensive programme of investigation for the development of the area was designed. The area was geologically mapped, the foundations for a proposed ring road were tested by seismic timer, and arrangements made for a seismic survey of a possible tunnel by the Geophysical Branch.

Other Foundation Investigations. The proposed site for an electricity substation was examined and tested by seismic timer to determine excavation and foundation conditions.

Advice was given to an insurance company on the stability of a T.V. mast on Black Mountain and to a construction company on foundation conditions for a tower on Red Hill.

Construction Materials

Sand and Gravel. The following sand and gravel deposits were inspected and, in some cases, evaluated by logging of auger holes and calculation of reserves: Department of the Interior stock resting paddock, Gungahalin.

Gungahlin Block 162.

Murrumbidgee and Gudgenby Rivers.

A comprehensive report on the known sand and gravel deposits around Canberra has been prepared.

Brick Shale and Clay Numerous enquiries have been dealt with and a shale deposit near Geary's Gap was inspected. Information was also given on pottery clay resources near Canberra.

Concrete Aggregate and Road-making Materials. Porphyry near the Cooma Road was examined and advice given to the leaseholder, and a source of road-building material for the access road to Corin Damsite was located. A new quarry site south-south-east of Mugga quarry was examined and advice given. General information on the aggregate resources of the area was given as required.

Building stones. Many enquiries were received and dealt with. A collection of building stones for teaching purposes is being made for the Canberra Technical College. Potential sources of supply of building stone at the following localities were inspected: Near Taemar bridge, N.S.W. (limestone).

Primrose Valley, N.S.W. (limestone and slate).

Sutton Road, A.C.T. (flaggy sandstone).

Drainage

The advice on drainage in the Woden Development area, referred to earlier, included the mapping of alluvial fan deposits and the installation and periodic reading of piezometers. Areas of potential drainage difficulties were defined.

Advice was given on a drainage-problem in the Red Hill area and on potential drainage difficulties in the Belconnen area.

Miscellaneous

The Lake George Mines' tailings dumps at Captains Flat were inspected on two occasions and a report on their stability was written for the National Capital Development Commission.

Resources of top-dressing soil in the Department of the Interior's stock-resting paddock, Gungahlin, were estimated. A record is being prepared on the alluvial flats and terraces of the Molonglo River.

Papua-New Guinea

Upper Ramu Hydro-Electric Project. Geological field services were provided by the Papua-New Guinea Resident Staff but the investigations were directed from Canberra and involved inspections by senior officers. Drilling continued very slowly during the year owing to inadequate equipment and difficulties inherent in the terrain and superficial material.

The weir site and intake portal of the scheme have been drilled and drilling of the tunnel route is in progress. Most attention has been given to the penstock area, however. Instability of the near-surface scree, alluvium and weathered rock, the danger of rockfalls, and the depth to sound foundations for the penstock supports, have required detailed investigation, which is still in progress. A decision will shortly

have to be made whether the surface penstock and power-station design is feasible. If it is considered not to be feasible a major investigation of a possible underground scheme will have to be undertaken.

Four possible damsites were inspected

Lower Warangoi Hydro-Electric Scheme, New Britain. The scheme proposed is for a power station served by water from a 120-foot high dam on the Lower Warangoi River, about 30 miles south of Rabaul. The scheme was inspected in March, and was geologically mapped from August - October. The scheme generally is sited in Miocene sediments but the abutments of the dam would be of agglomerate.

The abutments appear to be strong but their permeability is not known. A narrow divide between the Warangoi and Sigule River systems is composed of soft, poorly consolidated sediments which dip gently east. Some doubt exists at present whether the sediments are both strong enough and impermeable enough to permit water to be economically impounded in the Warangoi valley at this point. A very thorough investigation of the abutments, foundation and storage area of the proposed scheme will be needed. The scheme lies in a region of high earthquake hazard. Ample supplies of aggregate for any concrete structure appear to be available but other possible construction materials may be deficient.

Geophysical exploration, drilling and permeability studies will have to be undertaken next year.

NORTHERN TERRITORY

Since December 1963 drilling at the Darwin River and pondage sites has been logged by the Darwin Resident Geological staff. Drilling has been terminated as the discovery of adequate supplies of groundwater near McMinn's Lagoon has eliminated the immediate need for the Darwin River scheme.

The damsite appears adequately strong and watertight for a dam of the size envisaged and should permit a variety of designs. Further work on the damsite, and on the storage area generally, will be necessary before the feasibility and most economical design for the scheme can be established. The pondage sites would probably not be used. A record is being prepared on the investigation to date.

No further field work was done during the year by the Canberra Engineering Geology group on brick clay and shale and cement-making resources of the Darwin area.

A number of engineering geology reports was edited.

GENERAL

Commonwealth Centre, Melbourne. A £15 million development project for a block of Commonwealth-owned land bounded by Spring, Lonsdale, Exhibition and Latrobe Streets, Melbourne is being implemented. The proposed City of Melbourne underground railway will pass under the site. An investigation is in progress to determine foundation conditions for the proposed buildings and factors influencing the design of the building and the underground railway. The investigation is being carried out by the Victorian Mines Department for the Victorian Railways and Commonwealth Department of Works. The Engineering Geology Group is providing consulting services to the Department of Works.

Reserve Bank, Adelaide. At the request of the Commonwealth Department of Works an inspection was made of the site of a building for the Reserve Bank of Australia, which is under construction, and advice was given on the grouting needed to strengthen the foundations, which consist, in part, of Tertiary limestone with voids in it.

Peaceful Uses of Nuclear Explosives. In May the report of the technical mission to the U.S.A. to study the peacful uses of nuclear explosives (which spent September and October 1963 in the U.S.A.) was completed and presented to the Australian Atomic Energy Commission. The report was written jointly by the three members of the mission, one of whom is a member of the Engineering Geology Group.

Visits and Conferences. The only engineering conference attended during the year was the Annual Conference of the Institution of Engineers, Australia, held in Canberra in August 1964. Several visits were made to the Snowy Mountains Hydro-Electric Authority.

MISCELLANEOUS INVESTIGATIONS

GROUNDWATER

A.C.T. and Environs. Bore sites were selected at ABM Quarry, Federal Highway (2), Weetangera area (3), Cavan - Wee Jasper (3) and Jeir (2). Advice was given on drilling difficulties encountered in three other bores. A site was inspected near Majura (Woolshed Creek). Five other property owners were advised on the feasibility of drilling for water. Pumping or bailing tests were conducted or supervised on seven sites.

Two earth dams in Tuggeranong-Tharwa area were inspected and the use of groundwater in the village of Bredbo was assessed.

Routine measurements of water level, temperature and salinity of research bores in and around the A.C.T. were maintained. A record was kept of monthly variations of the temperature, salinity and level of Lake George. The effect on groundwater levels of the filling of Lake Burley Griffin was studied by means of seven bores drilled last year for the purpose; a preliminary report of initial results was prepared and distributed.

At the request of the Department of Works measurements were made of the temperature and salinity of Lake Burley Griffin at various depths.

A record was written on the development and use of groundwater measuring instruments in the A.C.T.

Northern Territory. A system was set up to keep track of the very numerous "Opinions on Bore Sites" submitted to the Geological Branch by the Senior Resident Geologist, Darwin. Several records on groundwater submitted by N.T. Resident staff were edited and processed.

PHOSPHATE

THE PHOSPHATE PROGRAMME

The first stage of the Bureau's long-term investigation for phosphate was a search for additional deposits of phosphate rock in the Pacific Islands and was carried out as a joint project with New Zealand. This investigation was completed in 1960 and unfortunately did not lead to the discovery of important new deposits. The results have been published as Bulletin 69.

Greater emphasis then fell on possibilities within the Australian continent although the record of phosphate occurrences in the mainland up to that time was not promising. However the subsequent discovery of phosphate at Rum Jungle and in the Amadeus Basin by the Bureau and indications of phosphate in the Bowen and Carnarvon Basins by private companies, together with new developments for phosphates overseas, have thrown new light on the whole question of phosphate search.

In 1963-64 the Bureau's phosphate programme was restricted to the investigation of prospects at Rum Jungle and in the Amadeus Basin. A summary of the results of this work appears later in these notes but, in brief, deposits at Rum Jungle appear to have only restricted local significance as a source of raw phosphate fertilizer and those in the Amadeus Basin, at the present stage of investigation, show little commercial promise.

Additional emphasis on the search for phosphate in 1964 engendered a wider approach to the problem and initiated a Bureau programme to review the possibilities both in land areas and on the Australian continental shelf.

For this reason investigations in the Amadeus Basin were interrupted, although a valid programme still remains there, in favour of a review of sedimentary basins, in the first place, to collate data basic to continued search for phosphate undertaken by Government or private organisations.

The immediate continental programme has two interrelated objectives:-

1. The review of data in all sedimentary basins directed to phosphate search.

2. A visit by an overseas expert on phosphate exploration to make an assessment of Australian prospects, and to guide future programmes.

Preliminary work on the presentation of the reviews has been carried out and the co-operation of some State Geological Surveys has already been sought. Arrangements have been sought for Dr. Sheldon of the U.S.G.S. to visit Australia for some months beginning June, 1964. A review of sedimentary basins will provide some of the basic data for the consultant's assessment and his report should guide Australian programmes in the immediate future.

OCEANOGRAPHY

The immediate programme has also two objectives:-

1. Arrange for a specialist on marine geology, with particular emphasis on phosphate, to collate and assess data on the Australian continental shelf and to advise on future programmes and equipment.

2. Collation of data on phosphate occurrence on the shelf and the extension of reconnaissance sampling of shelf sediments.

The Bureau is seeking arrangements for a suitable specialist in oceanography and it is hoped that this part of the programme can be effected in early 1965. In the meantime, a restricted programme to extend the reconnaissance sampling of bottom sediments by dredge and corer is proceeding and efforts this year on H.M.A.S. Gascoyne, with the good services of the R.A.N., have produced samples along the central coast of New South Wales (in co-operation with Sydney University) and in the Gulf of Carpentaria. Samples have also been obtained for part of the New South Wales coast from the University of Sydney and for the Arafura shelf, off Darwin, from the Scripps Institute and these will be analysed as soon as possible.

It is planned that oceanographic samples be analysed for about twenty four elements, largely by the automatic X-ray so that a wide range of geochemical data can be accumulated on shelf sediments as a basis for future investigations and research on aspects other than phosphate distribution.

The B.M.R. programme for 1965 will include the continuation of reconnaissance sampling, partly controlled by the availability and programming of R.A.N. frigates, but the extent of oceanographic investigations is likely to depend on Cabinet divisions related to phosphate search. Some discussion of oceanographic programmes has already taken place with Australian groups working in this field - C.S.I.R.O. and some staff members at the Universities of Queensland, Sydney, N.S.W. and Western Australia - and it is envisaged that Bureau activities should co-operate with and assist these groups as well as provide some degree of co-ordination in shelf investigations.

The successful trials in the Gulf of Carpentaria of a small dredge type sampler which can be operated without stopping or slowing down the oceanographic vessel should considerably assist the reconnaissance sampling programme.

PHOSPHATE ROCK AT RUM JUNGLE

Deposits of fluorapatite were first recognised in the Rum Jungle area in 1961. Sixteen deposits are known. All are associated with bodies of hematitic quartz breccia, hematitic sandstone and hematitic siltstone whose origin is the subject of much controversy. At the moment the phosphate deposits and the associated hematitic rocks are either thought to be part of a very folded and shattered Lower Proterozoic phosphorite sequence lying between the Coomalie Dolomite and the Golden Dyke formation, or they are thought to be formed by long and intense weathering of the Coomalie Dolomite. Whatever their origin the phosphate rock bodies occur as lenses which appear to have been enriched either by metasomatism or by weathering.

The largest of the bodies was tested in 1962 and shown to contain reserves of the order of 1,000,000 tons of material containing 5 to 37% P_2O_5 and averaging 10% P_2O_5.

In 1963 15,000 feet of rotary percussion drilling and 2,500 feet of diamond drilling were used to test the remainder of the known deposits and to prospect for new ones. Only one minor new deposit was found. The testing of the deposits showed that inferred reserves of 5,000,000 tons of fluorapatite averaging about 10% P_2O_5 are present in the Rum Jungle area. Of this amount possibly only 1,000,000 tons contains 20% or

more P_2O_5. Work in 1964 consisted of compiling final reports and plans of these investigations.

Apart from the inadequacy of known reserves, the large amount of finely divided hematite in Rum Jungle phosphate rock makes it unsuitable for the manufacture of superphosphate by present day methods.

The only foreseeable use for the Rum Jungle material is as ground rock fertiliser. C.S.I.R.O. is testing its value for this purpose and is having encouraging results using calcined material.

PHOSPHATE ROCK IN THE AMADEUS BASIN

The Amadeus Basin is located south-west and south of Alice Springs, in the southern part of the Northern Territory. The Basin trends westerly and is approximately 500 miles long by 150 miles wide. It is bounded on the north by the Arunta Complex and on the south by the igneous and metamorphic complexes of the Musgrave, Mann, and Petermann Ranges. The Basin is filled almost entirely with Upper Proterozoic and Palaeozoic sediments with a maximum thickness of over 30,000 feet along the northern margin. The rocks of the Basin are essentially shelf deposits and have been subjected to moderate folding and faulting.

B.M.R. geologists, who commenced mapping the Amadeus Basin in 1960, have observed and sampled numerous outcrops and rubble of pelletal phosphorite which occur in rock units of the Ordovician Larapinta Group, principally the Stairway Sandstone.

During the period 22nd July to 28th October, 1963, a programme of core drilling to test the Stairway Sandstone for the frequency and distribution of phosphorite and the grade of the material in the unweathered rock, was completed. Analysis of core samples has indicated a range of P_2O_5 content from less than 1 per cent to 22 per cent. No deposit of economic significance was penetrated in the four drill holes completed. The most promising interval of phosphorite was encountered in DDH/AP4, in the extreme south-east corner of the Lake Amadeus 1:250,000 Sheet, where an 11 foot section averaged 3.0 per cent. P_2O_5. The investigation was written up in 1964 and some check sampling is being done to investigate more fully the degree of up-grading of phosphatic beds in the zone of weathering.

Numerous analyses of various types of sediment have demonstrated that only pelletal material contains more than 2 per cent P_2O_5.. The most abundant developments of pellets occur in the sandy units of a silt facies of the Stairway Sandstone which is prominent in the central western and southern parts of the Basin. Field data are as yet insufficient to draw a detailed facies map of the Stairway Sandstone.

Critical consideration of that part of the geochemical cycle of phosphate relevant to marine phosphorite, the field data, and comparison of the Amadeus phosphorite with that of known well-documented deposits indicates that the distribution of phosphorite in the Amadeus Basin was probably controlled by topographical high areas on the Ordovician sea floor.

Although the potential for the existence of economic deposits of phosphorite in the Amadeus Basin must be regarded as low, two features of the occurrence of phosphorite warrant further investigation; the apparent surface enrichment and likely increase in grade on, or immediately adjacent, to high areas on the Ordovician sea floor.

GEOLOGICAL MAPPING AND MAP COMPILATION

1:5,000,000 Scale Geological Map of Australia and Oceania (International Geological Map of the World).

Sheets 6,7, 11 and 12, covering Australia and New Guinea (including West Irian) have been fair drawn and the contract let for printing. Work on the revision of the compilations of the four sheets was carried out discontinuously during the year.

Sheets 2,3, 4 and 5 - a complete geological compilation, with revised bathymetry, was received from the U.S. Geological Survey. The topographic base is being revised by the Division of National Mapping.

Sheet 8 - contributions are still outstanding from two sources - New Caledonia and New Hebrides.

1:6,000,000 scale Geology of Australia for the Atlas of Australian Resources (2nd edition). Compilation of this map for the R.I. & D. Branch of the Department, is based on the map of Australia and Oceania and is almost complete.

1:5,000,000 scale Underground Water Map of Australia. With the assistance of T. Quinlan this map has been substantially completed for the Technical Committee on Underground Water. It is based largely on diverse contributions by State and Territory authorities and an initial compilation by the R.I. and D Branch.

A similar map is being produced for the Atlas of Australian Resources.

MAP EDITING

Since the last "Summary of Activities" was written map sheets have been edited as follows:

Preliminary Editions — Editing completed November-December 1963-1 1:250,000 Scale

Editing completed 1964 (to end of October) - 24 1:250,000 Scale

, 3 1:500,000 Scale

Editing in progress 1 1:250,000 Scale.

Final (coloured) Editions — Editing complete Nov.- December 1963 5 1:250,000 Scale

Editing completed 1964 (to end of October) - 7 1:250,000 scale; 1 1:500,000 scale

Editing in progress 4 1:250,000 scale

Non-Standard Editions — Sheets 6,7, 11 and 12 of 1:5,000,000 scale geological map of Australia and Oceania in editing complete. 1:6,000,000 Geology of Australia and 1:5,000,000 Underground Water Map of Australia - editing in progress.

STRATIGRAPHIC INDEXING

Current literature was checked for new stratigraphic names throughout the year, all proposed names and changes of nomenclature submitted were checked for availability and the Central Register of Stratigraphic Names was maintained. Monthly lists of proposed names and changes in nomenclature were issued to Divisional Stratigraphic Nomenclature Sub-Committees.

The Victorian Lexicon of Stratigraphy was sent to the general editor in Paris; page proofs of about half of the lexicon were received, checked and returned to the editor.

Work was begun on the preparation of an author index of Australian stratigraphic names.

Return visits were made with, and by, the stratigraphic indexer of the Geological Survey of N.S.W. to bring the subject indexes of the Bureau and the Survey into agreement.

RECORDS PRODUCED

The following records were produced by the sub-section during the last twelve months:

1963/149 Annual Summary of Activities for 1963 Miscellaneous investigations, map compilations and map editing. - D.E. Gardner.

1963/157 Control of drainage by pumping at Red Hill, Canberra, A.C.T. - by E.G. Wilson and L.C. Noakes.

1964/17 The Fourth Australia-New Zealand Conference on Soil Mechanics and Foundation Engineering - Adelaide, August, 1963. - by E.G. Wilson.

1964/105 The geology of a possible hydro-electric scheme on the lower Warangoi River, New Britain, T.P.N.G. Preliminary inspection March, 1964. by - E.K. Carter and J.P. McGregor.

1964/140 Foundation gravity and joint permeability measurements at Bendora Dam, A.C.T. - by J.K. Hill.

At least 12 other Records are being prepared.

MISCELLANEOUS

Members of the sub-section attended various sessions of ANZAAS, held in Canberra at the end of January.

Assistance was given with the preparation of sets of rock collections for teaching purposes to the Cotter River was conducted for A.C.T. High Schools and on Geological excursions for A.C.T. High School teachers.

Silica content of rock in some A.C.T. quarries was investigated in connection with a claim for compensation arising from an alleged death from silicosis.