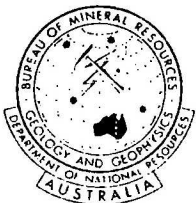


1977/10  
copy 3

BMR PUBLICATIONS COMPACTUS  
(LENDING SECTION)



055658



RECORD 1977/10

# BUREAU OF MINERAL RESOURCES 1977 PROGRAM

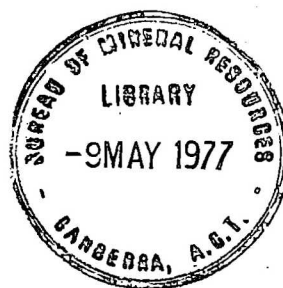
BMR  
Record  
1977/10  
c.3

Record 1977/10

BMR 1977 PROGRAM

Compiled by

I.G. Hone



The information contained in this report has been obtained by the Department of National Resources as part of the policy of the Australian Government to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus or statement without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

## INDEX

	<u>Page</u>
BMR OBJECTIVES	1
RECONNAISSANCE PROGRAM	4
INTRODUCTION	4
GEOLOGICAL SURVEYS	4
Antarctica	4
Canning Basin	5
Carpentaria, McArthur, Ngalia, Officer, Wiso	
Basins	5
Papua New Guinea	5
AIRBORNE SURVEYS	5
Albany Fraser and Yilgarn Blocks	5
Antarctica	5
Arunta Block	6
Carpentaria Basin	6
Lachlan Belt	6
McArthur Basin	6
Nicholson-Mount Isa Belt:Duchess	6
Officer Basin	7
Pine Creek Block	7
MARINE GEOLOGY	7
Capricorn/Bunker Reefs	7
East, and southeast Australian shelf, and	
Bass Strait	7
Indian Ocean drilling	7
Manganese nodules	7
West Australian shelf	8

	<u>Page</u>
MARINE GEOPHYSICS	8
Continental margins survey	8
Division of National Mapping co-operative projects	8
International co-operative projects	8
GRAVITY	9
Antarctica	9
Australia-wide	9
PETROLEUM RESOURCES PROGRAM	10
INTRODUCTION	10
BASIN REVIEW AND RESOURCE ASSESSMENT	10
Basin review - regional investigations	10
Petroleum resource assessment	11
PETROLEUM TECHNOLOGY	11
Enhanced recovery techniques	11
Geochemical investigations	12
Petrophysical investigations	12
PETROLEUM INDUSTRY	12
Review of industry	12
Technical administration of legislation	13
BASIN SURVEYS	13
Galilee Basin	13
Georgina Basin	13
Surat Basin	14
PALAEONTOLOGY	14
MINERAL RESOURCES PROGRAM	15
INTRODUCTION	15
PROVINCE STUDIES	15
Arunta Block	15
Georgetown Block	16



	<u>Page</u>
Georgina Basin	16
Lachlan Belt	17
McArthur Basin	17
Nicholson-Mount Isa Belt: Duchess	18
Lawn Hill	18
Mount Isa-Cloncurry	18
Westmoreland	19
Pine Creek Block	19
Tennant Creek	19
ORE GENESIS AND MINERAL CONTROLS	19
Alkaline ultramafic rocks	19
Cullen Granite	19
Hodgkinson Belt	20
Mineral sands, offshore	20
Mineral sands, onshore	20
Pilbara Block	20
Redbank	20
Spencer Gulf	20
Stuart Shelf	21
Uranium mineralisation	21
Volcanology and ore genesis	21
Western Tasmania	21
MINERAL ECONOMICS	21
MINING ENGINEERING	22
MINERAL RESOURCE ASSESSMENT	23
EARTH STRUCTURE AND PHYSICAL PROPERTIES PROGRAM	24
INTRODUCTION	24
CRUSTAL STUDIES	24
East Papua crustal survey	24
Lachlan Belt quarry blast recording	24
Pilbara crustal survey	25
Regional stress	25

	<u>Page</u>
GEOHERMAL STUDIES	25
Heat flow measurements	25
Theoretical studies	25
GEOHERYSICAL OBSERVATORIES	25
Canberra Observatory Group	25
Outposts:       Macquarie Island Observatory	26
Mawson Observatory	26
Mundaring Observatory	26
Toolangi Observatory	27
Regional gravity	27
Regional magnetics	28
EQUIPMENT AND SYSTEMS DEVELOPMENT PROGRAM	29
INTRODUCTION	29
Airborne systems	29
Crustal studies systems	29
Digital seismic systems	30
Down-hole EM methods	30
Drilling fluids	30
Geotechnical systems	30
Geothermal systems	31
Marine exploration systems	31
Marine survey systems	31
Observatory systems	31
Palaeomagnetic systems	32
Radiometric methods	32
Transient EM method	32
GEOTECHNICAL SERVICES AND HYDROGEOLOGY PROGRAM	33
INTRODUCTION	33
ENGINEERING GEOSCIENCE	33
Damsite and reservoir investigations	33
Environmental and pollution studies	34
Urban and regional development	34

	<u>Page</u>
HYDROGEOLOGY	35
Australian Capital Territory and environs	35
Christmas Island	35
Great Artesian Basin	35
Murray-Goulburn	36
Rutherglen-Albury	36
FOREIGN AID PROGRAM	37
Advice to committees	37
Fiji	37
Irian Jaya	37
Papua New Guinea	37
Training courses	37
INFORMATION SYSTEMS AND REFERENCE COLLECTIONS PROGRAM	38
INTRODUCTION	38
INFORMATION SERVICES	38
Information dissemination	38
Library	39
Stratigraphic Index	39
Technical Files	39
NATIONAL MAPS	39
Atlas of Australian Resources	39
BMR Earth Science Atlas	39
International commitments	39
REFERENCE COLLECTIONS	40
Core and Cuttings Laboratory	40
Museum	40
Palaeontological Collection	40
ADMINISTRATIVE AND TECHNICAL SERVICES	41
Administrative services	41
Automatic data processing	41
Drafting	41

	<u>Page</u>
Drilling	41
Editing	41
Laboratories	41
Photogeology and remote sensing	42
Planning and co-ordination	42

APPENDIX: PUBLICATIONS IN PROGRESS

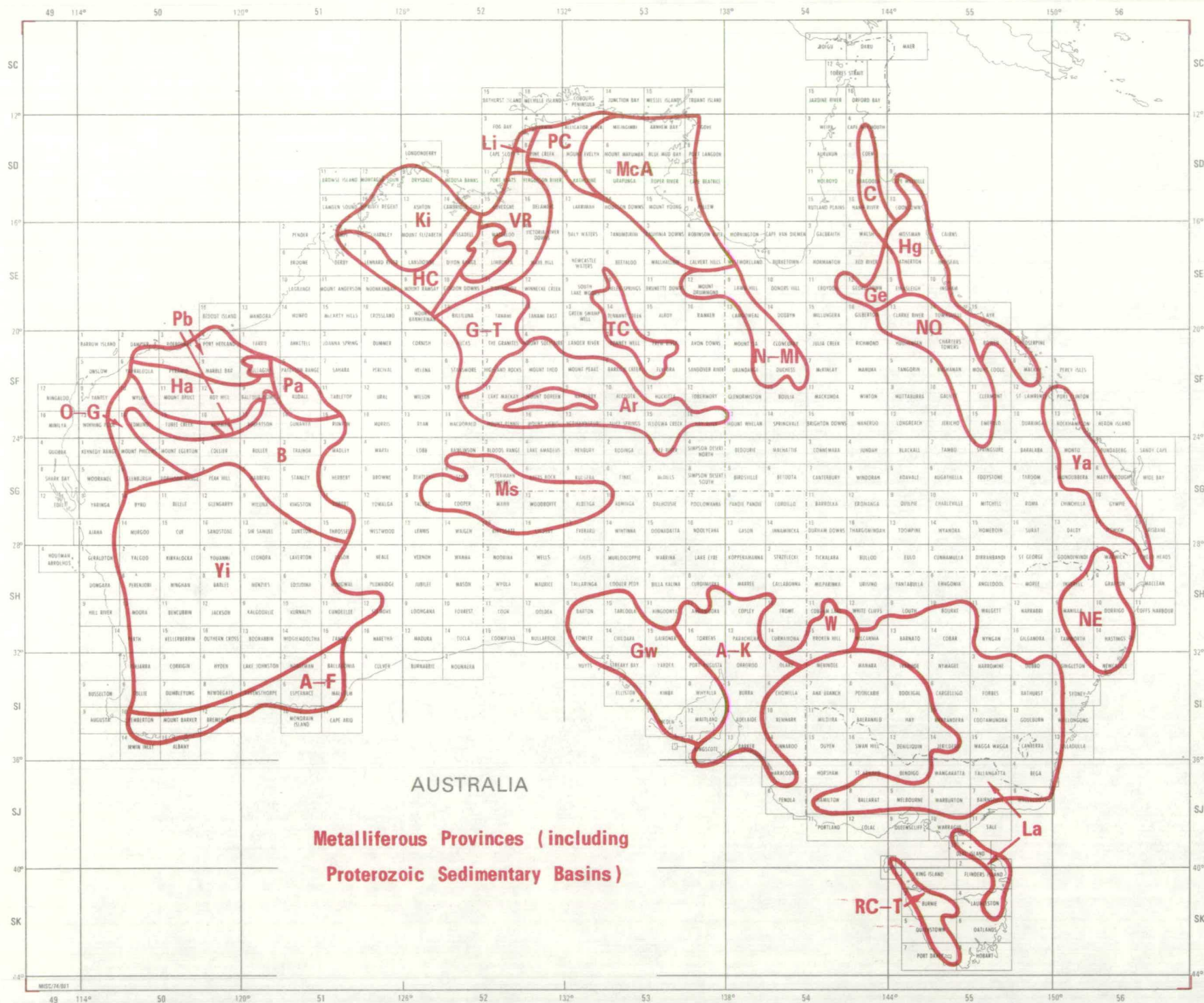
## NOTES

The program does not list the preparation of BMR Records on the results of current projects; however, it can generally be assumed that Records will be prepared for most projects. A list of Records released on Open File is issued regularly by BMR.

The dates given in brackets after each field operation refer to time actually spent in the field. Usually office work on the project continues to the end of the current year or early in the following year.







# LEGEND

A-K	Adelaide – Kanmantoo
A-F	Albany – Fraser
Ar	Arunta
B	Bangemall
C	Coen
Gw	Gawler
Ge	Georgetown
G-T	Granites – Tanami
HC	Hall's Creek
Ha	Hamersley
Hg	Hodgkinson
Ki	Kimberley
La	Lachlan
Li	Litchfield
McA	McArthur
Ms	Musgrave
NE	New England
N-MI	Nicholson – Mt Isa
NQ	North Queensland
O-G	Ophthalmia – Gascoyne
Pa	Paterson
Pb	Pilbara
PC	Pine Creek
RC-T	Rocky Cape – Tyenna
TC	Tennant Creek
VR	Victoria River
W	Willyama
Ya	Yarrol
Yi	Yilgarn

### BMR OBJECTIVES

The work of BMR is designed to increase the available knowledge of the geology, geophysics, and mineral resources (including petroleum) of the Australian continent, its Territories, and offshore areas, as a basis for the formulation of national mineral and energy policies and for assistance to mineral exploration and development. BMR also has the role of providing a link between Australian and international geoscience, and of providing geoscience information and services for use in engineering design and urban development.

BMR activities are directed at six major objectives:

- |   |  |
|---|--|
| Resource Assessment                     | To assess the extent and availability of Australia's known and potential mineral resources, for use in resource management and for establishing long-term geoscience research requirements.  |
| Assistance to Exploration               | To provide fundamental geoscience data and information and develop new techniques and concepts to assist and stimulate mineral exploration and development.  |
| Geoscience Studies of Man's Environment | To identify and assess geoscience factors that affect the environment, man-made structures and urban development, for application to land use planning, engineering design, and protection of the environment.   |
| Mineral Industry Review                 | To provide information and technical advice to the the Federal Government, industry and public on the mining and petroleum industries in Australia and overseas, and on geoscience aspects pertaining to the Federal Government's offshore jurisdiction. |



Information      To ensure adequate dissemination and integration of  
Dissemin-      geoscience data and information generated by govern-  
ation            ment, industry, and scientific institutions to  
                  maximise utilisation of existing knowledge and avoid  
                  wasteful duplication of effort.

International    To contribute to global geoscience through inter-  
Commitments    national scientific arrangements and through  
                  Australian foreign aid programs.

To achieve these objectives, multidisciplinary programs are undertaken, and are integrated, where appropriate, with State, university, and industry programs. Current BMR programs are:

Reconnaissance surveys designed to provide a broad understanding of the composition, structure, subdivisional units, and tectonic history of the Australian continent and continental margin, and to provide some indication of resource potential and key areas worthy of more detailed study. The results of reconnaissance surveys are usually published as standard 1:250 000 scale maps and associated interpretative reports.

Petroleum resources studies directed at all aspects relating to the origin (source, maturation, migration, entrapment), exploration, and recovery of both onshore and offshore resources, with a view to assessing discovered and potential resources and encouraging further exploration.

Mineral resources studies aimed at assessing the availability of metallic and non-metallic mineral resources on the Australian continent and continental margin. Of prime concern is the relation between mineral occurrences and their geological environment; the main effort of this program is directed at multi-disciplinary province studies, studies of geological factors controlling mineralisation, and commodity studies.

Earth structure and physical properties studies into the geodynamic, gravitational, geomagnetic, and geothermal properties of the Australian region and their relation to similar data from around the world. The studies provide: key information on large-scale structures and tectonic trends with which mineral, petroleum, and geothermal energy resources may be associated; information necessary for establishing earthquake risk; and information for land survey and navigational maps.

Equipment and systems development to improve available technology of data acquisition, processing, and interpretation. This program is directed at improving geophysical techniques used in delineating subsurface geological structure and mineral deposits.

Geotechnical services and hydrogeological studies to provide advice for construction and development projects initiated by Federal Government agencies, and sometimes other authorities, and to provide a basis for water resource assessment and management.

Foreign aid commitments fulfilled by providing advice on technical aspects of foreign aid requests, providing Australian representatives and advisers to international agencies, and direct participation in foreign aid programs.

Information systems and reference collections to disseminate information through formal publication in scientific journals and reports and through the provision of information services, reference collections, and national maps summarising existing knowledge.

Administrative and technical services for management and co-ordination of BMR operations, and for support of scientific investigations.

## RECONNAISSANCE PROGRAM

### INTRODUCTION

As part of the continuing program to complete systematic coverage of Australia, geological and airborne magnetic and radio-metric surveys will be conducted. BMR's reconnaissance geological program is aimed at providing map coverage of Australia and its Territories at a scale of 1:250 000; the initial coverage is nearing completion. BMR operates two aircraft in its reconnaissance airborne program, and some of the program is undertaken by contractors.

Systematic reconnaissance offshore geological surveys are being conducted to study the physical and chemical processes controlling the accumulation of sediments and minerals. Data from previous reconnaissance marine geophysical surveys are being processed and analysed to obtain details of structures within the uppermost few thousand metres of sediments on the continental slope and margin, and to establish regional tectonic trends and basement variations.

### GEOLOGICAL SURVEYS

#### Antarctica

Undertake reconnaissance mapping in Enderby Land (Jan-Mar); collect rock samples for palaeomagnetic measurements.

Carry out geochemical, petrological and geochronological studies on rock samples, with emphasis on enderbites and granulite facies rocks.

Prepare publications on previous studies on the Prince Charles Mountains.

## Canning Basin, WA

In a joint project with the Geological Survey of Western Australia (GSWA), map the Pender, Broome, La Grange, Mandora, Munroe, McLarty Hills, Yarrie, Anketell, Joanna Spring and parts of the Paterson Range and Port Hedland 1:250 000 Sheet areas.

Prepare publications on previous field work.

## Carpentaria, McArthur, Ngalia, Officer, Wiso Basins.

Prepare publications on previous field work.

## Papua New Guinea

Prepare a map of and a report on New Britain.

## AIRBORNE SURVEYS

### Albany Fraser and Yilgarn Blocks, WA

Conduct an airborne magnetic and radiometric survey of the Pemberton, Mount Barker, and Bremer Bay 1:250 000 Sheet areas (Aug-Nov).

Process data from the 1976 airborne survey of the Dumbleyung, Newdegate and Hyden 1:250 000 Sheet areas.

### Antarctica

Take airborne magnetic measurements over Enderby Land in conjunction with an ice radar survey conducted by Antarctic Division.

Arunta Block, NT

Process data from the 1976 airborne survey of the Mount Peake, Napperby, Hermannsburg (northern half), Lake Mackay, Mount Doreen, and Alice Springs (one-sixth) 1:250 000 Sheet areas.

Carpentaria Basin, Qld

Interpret and report on 1973/74 airborne survey data.

Lachlan Belt, Vic, NSW

Carry out an airborne magnetic survey of the Murrumbidgee 1:250 000 Sheet area (Mar) and an airborne magnetic and radiometric survey of the Warburton 1:250 000 Sheet area (Sept-Oct).

Process airborne magnetic and radiometric data obtained over the Cootamundra, Bega, Ulladulla, and Bairnsdale 1:250 000 Sheet areas. Prepare an operational report on the 1976 airborne survey of the Bega and Ulladulla 1:250 000 Sheet areas.

McArthur Basin

Carry out an airborne magnetic and radiometric survey of the Hodgson Downs, Urapunga, Roper River, Mount Young, Pellew, Calvert Hills, Robinson River, Bauhinia Downs, Tanumbirini and Wallhallow 1:250 000 Sheet areas (May-Sept).

Nicholson-Mount Isa Belt, Qld

Process data from the 1975 Duchess airborne magnetic and radiometric survey.

#### Officer Basin, WA

Continue supervising and processing data from the aeromagnetic contract survey of the Scott, Cooper, Bentley, Talbot, Browne, Yowalga, Westwood, Lennis, Waigen, Neale, Vernon, Wanna, Jubilee, and Mason 1:250 000 Sheet areas.

#### Pine Creek Block, NT

Process airborne magnetic and radiometric data obtained in 1975 over the Mount Evelyn and Katherine 1:250 000 Sheet areas. Interpret airborne surveys conducted in 1974 and 1975.

#### MARINE GEOLOGY

##### Capricorn/Bunker Reefs, Qld

In co-operation with the Geological Survey of Queensland (GSQ) carry out seismic reflection profiling to improve knowledge of the pre-Holocene karst surface upon which the reefs lie (April-May).

East, and southeast Australian shelf, and Bass Strait.

Prepare publications on previous surveys.

##### Indian Ocean drilling

Prepare samples, and conduct X-ray diffraction measurements as a contribution to the DSDP Indian Ocean Project.

##### Manganese nodules

Undertake reconnaissance surveys of manganese nodules in the Southern Ocean (as ship-time becomes available).

## West Australian shelf

Carry out a marine geological reconnaissance survey of the West Australian continental shelf from Geraldton to Cape Leeuwin (Sept-Dec). Undertake shallow seismic profiling of the shelf (in co-operation with the Division of National Mapping); interpret seismic profiles.

## MARINE GEOPHYSICS

### Continental margins survey

Analyse and report on results of the 1970-73 contract marine geophysical survey of the Australian continental margin; the survey produced reconnaissance seismic, gravity, magnetic, and bathymetric data on the nature and extent of the continental margin. Currently scheduled are interpretative reports on the Carnarvon, and Ceduna Terraces, Scott, Naturaliste, South Tasmania and East Tasmania Plateaus, Timor Trough, offshore Perth and Otway Basins, and offshore NSW and western Tasmania. Geophysical data will be presented as 1: 1 million scale maps.

### Division of National Mapping co-operative projects

Organise and support magnetic and shallow seismic reflection surveys on Division of National Mapping bathymetric surveys. Review existing magnetic data over marine areas.

### International co-operative projects

Participate in the Lamont-Doherty Geological Observatory survey of the Coral Sea and Norfolk Ridge (Jan-Feb), and of the eastern Wharton Basin (Aug-Sept).

Under the Australian-West German Science Agreement, participate in the survey of the Scott Plateau and adjacent abyssal plain to investigate the northwest Australian

continental margin to the Java Trench (Feb-Mar), and the survey of the Sulu-Celebes Basin (April).

Produce operational reports on surveys made in co-operation with Woods Hole Oceanographic Institute in the Timor Sea, Banda Arc, and Argo Abyssal Plain in 1976.

## GRAVITY

### Antarctica

Carry out gravity surveys in Enderby and Kemp Lands (Jan-March).

### Australia-wide

Continue updating the computer-based data bank of gravity survey data. Check data for consistency; adjust values of anomalous stations and, where necessary, make field observations to fill in gaps and tie-in existing surveys. For areas in which data are finalised produce free-air and Bouguer anomaly maps using international scale and datum.

Continue interpreting gravity maps of Australia to provide a background for petroleum and mineral search.



## PETROLEUM RESOURCES PROGRAM

### INTRODUCTION

As part of an on-going program to assist exploration, and towards assessment of Australia's overall petroleum resources, the 1977 program includes: a review of data on specific sedimentary basins, estimations of known and undiscovered resources, and field investigations to upgrade geological knowledge in key areas.

The program is supported by laboratory investigations in petroleum geochemistry and petrophysics, reservoir engineering, and palaeontological studies. Petroleum industry studies are programmed to maintain a continuous review of all aspects of Australian identified petroleum resources, and of exploration and development activities.

BMR has a continuing responsibility with respect to the technical administration of the Petroleum (Submerged Lands) Act and has programmed accordingly.

### BASIN REVIEW AND RESOURCE ASSESSMENT

#### Basin review - regional investigations

Complete and report on a detailed study of all available data on the Canning Basin.

Carry out regional reviews of the Bass, Capricorn, Clarence-Moreton, Georgina, Laura, Maryborough, Ngalia, Officer, Otway, Papuan, offshore Queensland, and Wiso Basins.

Continue reviewing existing geophysical data of the basins underlying the Eromanga Basin in order to determine their

limits and distinguish between overlapping basins; recommend further surveys and studies for areas in which geological or geophysical knowledge is deficient.

#### Petroleum resource assessment

Carry out preliminary assessments of the undiscovered petroleum resources of the Bass, Bonaparte, Browse, Canning, Carnarvon, Gippsland, Otway, Perth, and offshore Queensland Basins, the Great Australian Bight region, and, in co-operation with the SA Department of Mines, the Cooper Basin.

Develop methodology for petroleum resource assessment.

Make initial evaluations of petroleum discoveries and estimate petroleum reserves of reservoirs and fields in Australia. Evaluate the life expectancy of Australia's oil and gas fields, with the Cooper Basin as first priority.

Estimate the economics required to bring currently non-commercial discoveries into production.

#### PETROLEUM TECHNOLOGY

##### Enhanced recovery techniques

Conduct polymer flood tests on rocks from the depleting Moonie reservoir in co-operation with industry and the Queensland Mines Department.

Carry out laboratory investigations into the recovery of hydrocarbons from Australian reservoirs under various natural drive mechanisms to assist in the evaluation of recoverable petroleum reservoirs.

## Geochemical investigations

Continue research into the processes of petroleum generation in Australia, including source rock studies in the Galilee, Georgina, and Pedirka Basins and studies of the composition of heavy oil associated with oil shale from Queensland.

Make routine oil, gas, and bitumens analyses from various operations including drilling operations under the Petroleum (Submerged Lands) Act.

Develop an ADP scheme for basin-wide source rock evaluation.

With CSIRO review methods of identifying source rocks and their maturation history. Standardise interpretative methods.

## Petrophysical investigations

Carry out porosity, permeability, density, fluid saturation, capillary pressure, and relative permeability investigations of petroleum reservoir rock samples from wells drilled under the Petroleum (Submerged Lands) Act, BMR field parties, State mines departments, and private sources.

## PETROLEUM INDUSTRY

### Review of industry

Carry out investigations and research into the economics of petroleum exploration, development, and production on land and offshore. Provide specialised technical advice and prepare statistics. Maintain well data card and petroleum titles data systems and commence conversion of these into a computer-based system. Prepare the Petroleum Newsletter, Petroleum Exploration and Development Titles Map and Key, and report on drilling of wells in Australia.

Investigate oil shale resources.

#### Technical administration of legislation

Examine and advise on applications to carry out operations under the Petroleum (Submerged Lands) Act, follow the progress of operations and examine final reports. Index, store, and make available as appropriate the data received under the Act. Maintain a register of all operations undertaken in offshore areas, and one of relinquished and current offshore areas. Continue developing a computer-based file of offshore drilling and geophysical operations. Assess the petroleum prospectiveness of relinquished offshore title areas and advise on their readvertising. Advise on regulations and directions pertaining to offshore areas.

Prepare directions for and inspect and report on operations on behalf of the Department of the Northern Territory and the Government of Papua New Guinea.

#### BASIN SURVEYS

##### Galilee Basin, Qld

Prepare an operational and an interpretative report on the 1976 seismic survey in co-operation with GSQ. Investigate the necessity for a further seismic survey.

Summarise the biostratigraphy and sedimentary environment of marginal sediments of the Eromanga Basin overlapping the Galilee Basin between Hughenden and Jericho.

##### Georgina Basin, Qld (see also Province Studies)

Review previous geophysical results.

Carry out a seismic survey in the southeast to investigate the Toomba Fault and tie previous seismic traverses to the Ethabuka No. 1 and Netting Fence No. 1 wells and to outcrops, to provide better structural control. Take semi-detailed gravity measurements along the seismic traverses (June-Nov).

Surat Basin, Qld

Complete reporting on the Roma Shelf seismic survey.

#### PALAEONTOLOGY

Provide palaeontological support for field projects and carry out systematic studies of Australian fossils. Projects include preparation of Australia-wide correlation charts for Adelaiddian stratigraphy; studies of Precambrian microfossils from the Amadeus Basin, microfossils and stromatolites from the McArthur, Georgina, and Nabberu Basins, and sedimentary phosphorites associated with Precambrian stromatolites; late Cambrian trilobites from northern and central Australia and Antarctica; Ordovician graptolites; Silurian brachiopods from Canberra and conodonts from eastern Australia; conodonts from the Lennard Shelf and Devonian conodonts from the Carnarvon Basin; Australian and Antarctic Devonian fish; early Carboniferous ostracods, and ostracods from the Bonaparte Gulf Basin; correlation of the Permian and studies of its fossils; studies of Jurassic Belemnoidea and Bivalvia from the Sula Islands and Mesozoic fossils from Misool Island, Indonesia; revisions of Mesozoic Mollusca and Cretaceous Ammonoidea and Bivalvia of Australia and PNG; palynology of the Mount Eclipse Sandstone, Ngalia Basin, and of the Galilee Basin, and Tertiary palynology of central Australian lignite deposits; Tertiary vertebrates from NT, Qld, and SA; Tertiary foraminifera from PNG; larger foraminifera from Victoria, and Wreck Island No. 1 well; upper Cretaceous/lower Tertiary nannofossils from the Carnarvon Basin; Oligo-Miocene nannofossils from Victoria and Eocene nannofossils from the Otway Basin.

## MINERAL RESOURCES PROGRAM

### INTRODUCTION

BMR is continuing its program of upgrading basic geo-science information on metalliferous provinces to assess Australia's total mineral resources and assist exploration and development. Multidisciplinary investigations will be conducted in seven metalliferous provinces; of special interest is the commencement of an extensive investigation in the McArthur Basin. Additional research is being carried out to define more accurately factors influencing the genesis and localisation of mineral deposits within particular geological regions.

Trends in the exploration for minerals, and in mining, processing, trade, and consumption of mineral commodities, are being assessed and reviewed continually. Resource assessment continues with compilation, estimation, and evaluation of identified and undiscovered mineral resources.

### PROVINCE STUDIES

#### Arunta Block, NT

Collect samples from the Lander Rock Beds and Tertiary weathering profiles for palaeomagnetic measurements, and samples of kornerupine granulite for mineralogical studies (Aug).

Compile photo-overlays of the Denison and northern half of the MacDonnell Ranges 1:100 000 Sheets. Correct photo-scale compilations of the Undoolya, Riddoch, Aileron, and Fergusson Range 1:100 000 Sheets. Photo-interpret the southern half of the Huckitta 1:250 000 Sheet area. Prepare reports and publications on previous geological, geochemical, and geochronological work.

Georgetown Block, Qld (joint project with Geol. Survey of Qld)

Investigate the geology, mines and mineral deposits, resources, and potential of the Forest Home, North Head, and parts of the Gilbert River, Esmeralda, and Abingdon Downs 1:100 000 Sheet areas. Study the petrogenesis, mineralisation, and isotopic ages of the igneous rocks in the area; the chemistry and structure of the metamorphic rocks; and the nature and genesis of the gold deposits of the Etheridge Goldfield. (July-Oct). Continue laboratory investigations of the Jubilee-Plunger gold deposit and the Mount Turner copper-molybdenum deposit. Continue geochronological investigations of the rock units.

Assess the mineral resources and potential of the central Georgetown Inlier and develop hypotheses of ore genesis and location that can be tested by exploration.

Compile and interpret results of the geochemical survey of the Forsayth, Gilberton, and Georgetown 1:100 000 Sheet areas. Prepare reports on the 1973 airborne geophysical survey of the Forsayth 1:100 000 Sheet area, and the 1976 ground geophysical surveys of the Jubilee-Plunger and Mount Turner prospects. Prepare publications on previous field work.

Georgina Basin, Qld

Complete geological mapping in the Neeyamba Hill, Mount Whelan, Adam, and part of the Mount Barrington 1:100 000 Sheet areas. Using palaeomagnetism to provide a dating control study the relation of geomorphology and deep weathering profiles to Cainozoic structural movements and deposition. Complete the hydrogeological study of the southern part of the basin in NT. Revise mapping of the Mesozoic sequences adjoining the basin. To assist in the studies, undertake shallow stratigraphic drilling west of Marion Downs (Jul-Oct).

Carry out a detailed airborne survey of the eastern part of the Glenormiston 1:250 000 Sheet area (Aug).

Study the mineralogy and petrology of carbonate rocks to ascertain the controls over the concentration of lead and zinc.

#### Lachlan Belt, NSW

Commence geological mapping and stream sediment sampling in the Araluen 1:100 000 Sheet area (Jun-Dec) and continue geological mapping of the Canberra 1:100 000 Sheet area (Jan-Dec). Prepare publications on previous field work in the Tantangara and Brindabella 1:100 000 Sheet areas, and report on geophysical surveys over the Woodlawn orebody.

#### McArthur Basin, NT

Conduct an in-depth study of the stratigraphic, sedimentological, and tectonic evolution of the McArthur Basin; apply the results to determine the genesis of base metal ore deposits and define geological factors to be considered in directing exploration.

The study includes: geological investigations in the Mallapunyah, Kilgour, Glyde, and Lancewood 1:100 000 Sheet areas (July-Oct);

an experimental magneto-telluric (M-T) survey to ascertain M-T's applications for defining basement depth, configuration, and resistivity, resolving electrical layers above the basement, locating and defining the form of major structures, and determining the response of audio-M-T equipment to the HYC deposit (July-Sept);

taking detailed gravity measurements to assess applications of the gravity method in delineating major structures (Aug); magnetostratigraphic studies (Sept).



Nicholson-Mount Isa Belt, Qld

(1) Duchess

Photo-interpret and carry out geological mapping in the Dajarra and Ardmere 1:100 000 Sheet areas. Complete mapping the Duchess 1:100 000 Sheet area and make reconnaissance traverses in the Selwyn, Mount Angelay, and Mount Merlin 1:100 000 Sheet areas (July-Oct). Study the petrology of metamorphic, metasomatic, and hydrothermally altered rocks, and the petrochemistry of selected granites.

Prepare publications on previous field work.

(2) Lawn Hill

Complete geological mapping of the Lawn Hill 1:100 000 Sheet area. Photo-interpret parts of and geologically map the Carrara, Gregory Downs, Mitchiebo, and Riversleigh 1:100 000 Sheet areas (July-Sept).

(3) Mount Isa-Cloncurry

Prepare photo-compilation maps and commence geological mapping of the Mammoth Mines and Coolullah 1:100 000 Sheet areas, and complete mapping in the Alsace 1:100 000 Sheet area (July-Sept).

Continue age-dating basement volcanics and intrusive granites. Investigate and report on the geochemistry of drill cores from Cloncurry No. 6 drill hole and complete reports on similar investigations of cores from Cloncurry No. 7 and 8 drill holes. Investigate uranium-skarn mineralisation at Mary Kathleen.

Prepare publications on previous field work.

(4) Westmoreland

Report on previous geochemical surveys.

Pine Creek Block, NT

Continue geological mapping of the Mundogie 1:100 000 Sheet area (July-Sept) using ground geophysical techniques to assist (June-Oct). Take ground magnetic and radiometric measurements, and conduct geological investigations where necessary to assist interpretation of the 1974/75 airborne survey (Aug-Oct). Investigate the use of palaeomagnetism for the correlation of rock units.

Study factors relating to uranium mineralisation (see Ore Genesis and Mineral Controls).

Prepare publications on previous field work.

Tennant Creek, NT

Prepare reports on the geochemistry and geochronology of the Tennant Creek Mineral Field.

ORE GENESIS AND MINERAL CONTROLS

Alkaline ultramafic rocks

Conduct a petrochemical and geochronological study of alkaline ultramafic rocks in order to determine their diamondiferous potential.

Cullen Granite, NT

Complete the exploratory study of the chemistry of Cullen Granite and on tin and uranium mineralisation contained in it and in the surrounding sediments.

#### Hodgkinson Belt

Continue geochronological investigations of vein deposits and mineralised and non-mineralised bodies of greisen in the Herberton-Mount Garnet area.

#### Mineral sands, offshore, NSW

Continue the detailed study of shelf morphology and, if funds are available, undertake exploratory drilling operations in areas of potential heavy-mineral sand deposits.

#### Mineral sands, onshore, SA, Vic

Study Pleistocene sea-level changes and the distribution and provenance of heavy-mineral sands in southeast SA and southwest Vic. As part of this project, carry out shallow stratigraphic drilling to investigate Quaternary strandlines in southwest Vic (Feb-April).

Conduct experiments on the precipitation and diagenesis of carbonates.

#### Pilbara Block, WA

As part of the International Geological Correlation Program on Archaean Igneous Geochemistry, continue trace-element characterisation studies of Archaean volcanic rocks from the Pilbara Block in co-operation with GSWA (July-Aug).

#### Redbank, NT

Investigate the source of copper mineralisation.

#### Spencer Gulf, SA

In conjunction with Baas Beeking Geobiological Research Laboratory conduct field and laboratory studies on sedi-

mentation in Spencer Gulf. The project will include the study of factors influencing carbonate deposition, production of primary organic matter, and formation, transportation and fixation of base metals.

#### Stuart Shelf, SA

Conduct a mineralogical and petrological investigation in the Mount Gunson area.

#### Uranium mineralisation

Conduct a petrographic, geochemical, and stable isotope study to locate the provenance area of uranium in the Pine Creek Block, the distribution and correlation of elements, and the conditions under which the uranium was formed.

#### Volcanology and ore genesis, PNG

Continue investigations of Cainozoic volcanoes in conjunction with the Australian National University, and prepare publications on volcanic geochemistry, and volcanoes offshore from New Ireland, and papers on petrology and tectonic studies of the volcanic region.

#### Western Tasmania

Complete the Rb-Sr isotopic investigations of the Cambrian/Precambrian boundary of western Tasmania, and determine the age of mineralisation.

#### MINERAL ECONOMICS

Study all aspects of the Australian and global mineral industry. Compile, interpret and publish statistics on production, trade and consumption. Review the iron-oxide, phosphate, refractories, and secondary lead-zinc industries

in Australia, and nickel production in the world. These studies contribute towards departmental advice and to the publication "Australian Mineral Industry Review".

Complete an assessment of the contribution made by the mining and mineral processing industries to the national economy in 1977. Make an in-depth study of the mineral industry in Australia and review the factors underlying changes in Australian tin reserves.

Complete an assessment of Australian equity in the domestic mineral industry and complete long-range mineral production and consumption projections for Australia.

Investigation of the use of ADP for the storage and presentation of price and currency exchange data.

#### MINING ENGINEERING

Participate in the Conference of Chief Inspectors of Mines and derived working groups.

In a cost study of the mining industry, ascertain mine capital and operating costs for various rates of mine production. Maintain schedules of mining royalties and other charges.

Provide advice to assist the Department of Environment, Housing and Community Development in the rehabilitation of mined-out areas. Assess product quotas and the performance of various mines. For the Department of Foreign Affairs, examine and recommend on the feasibility, development, and material assistance required for certain overseas mines.

Monitor developments in rock mechanics that may assist in extending recoverable ore reserves at depth, and in underground mass mining methods.

## MINERAL RESOURCE ASSESSMENT

Access Australia's total identified resources of arsenic, asbestos, copper, nickel, and tungsten. Conduct geostatistical studies of known copper/lead/zinc deposits in Australia as a basis for the estimation of undiscovered potential in known mineral provinces (hypothetical resources).

Review the geology of manganese nodules and the economics of nodule mining.

Continue reviewing the methodology of mineral resource assessment.

## EARTH STRUCTURE AND PHYSICAL PROPERTIES PROGRAM

### INTRODUCTION

Deep seismic, gravity, and magnetic surveys and interpretations of seismicity data are being used to investigate the geological structure and framework of the Australian continent and surrounding area, the tectonic processes which produced the present situation, and processes which are still active. Studies of heat flow assist in this work and will also help evaluate Australia's geothermal energy potential.

BMR has a major responsibility for the collection of Australian seismological and geomagnetic data, and for the establishment in Australia of internationally defined reference standards for the measurement of the Earth's gravity field; much of this work is done in co-operation with Australian universities and international organisations.

### CRUSTAL STUDIES

#### East Papua crustal survey

Interpret seismic, gravity, and high-level aeromagnetic data and examine seismic residuals from a 1973 USSR nuclear explosion to derive a model of the crustal structure beneath the Gulf of Papua and southeast Papua.

#### Lachlan Belt quarry blast recording, NSW, Vic

Determine the crustal structure beneath southeast Australia from seismic data recorded at stations between Wollongong and Ardlethan, and Marulan and Dartmouth using quarry blasts as energy sources, and from gravity data.

#### Pilbara crustal survey, WA

Record seismic data using iron-ore mine blasts as an energy source and conduct a semi-detailed gravity survey along two traverses (Mount Goldsworthy-Parraburdoo and Newman-Pannawonica) to determine the crustal structure.

#### Regional stress, SA

In collaboration with CSIRO, use over-coring techniques to measure the stress field in SA.

#### GEOHERMAL STUDIES

##### Heat flow measurements

Drill six holes near Mount Gambier (April-May) and two holes near Jugiong (Mar) for temperature gradient measurements in 1978. Take temperature gradient measurements in drill holes in north Queensland (Sept) and in other areas of Australia where heat flow data are sparse. Measure the thermal conductivity of core samples.

##### Theoretical studies

Model heat flow systems by computer.

#### GEOHERMAL OBSERVATORIES

##### Canberra Observatory Group

Maintain the Australian Geomagnetic Standards. Digitise and analyse magnetograms. Operate, test, and evaluate magnetic observatory equipment. A new magnetic observatory in east Kowen Forest is scheduled to be commissioned this year.



Maintain and calibrate seismographs at Alice Springs (NT), Manton (NT), Cooney (NSW), Giles (WA), and Kowen (ACT). Select a site for, and install, an SP vertical seismograph at Mount Isa or Cloncurry.

Prepare phase and epicentral data tapes for the International Seismological Centre and produce monthly phase and time sorted bulletins. Maintain regional earthquake data files and prepare seismicity maps. Locate regional earthquakes. Analyse seismograms from Alice Springs, NT, and Cooney, NSW.

Maintain a network of accelerographs and prepare and revise earthquake risk and seismicity maps. Carry out field studies of felt or damaging earthquakes and ground accelerations near large explosions. Prepare an atlas of isoseismal maps. Assemble information on the capabilities of Australian seismographs to detect underground explosions and to discriminate between explosions and natural seismic events.

#### Outposts:

##### Macquarie Island Observatory

Record and analyse geomagnetic and seismic observations.

##### Mawson Observatory

Record and analyse geomagnetic and seismic observations. Complete installation of equipment in the new office constructed in 1976.

##### Mundaring Observatory, WA

Continue recording, analysing, and reporting on geomagnetic, seismic, and ionospheric observations obtained at Mundaring and Gnangara and train personnel for Antarctic projects. Continue the normal program of SP recording at Giles, Kalgoorlie, Kununurra, Meeketharra, Marble Bar, and Swan

View and upgrade the seismograph at Kalgoorlie. Select a site near Gascoyne Junction for an SP seismograph and install an automatic magnetic observatory at Gnangara. Operate the USGS Seismological Research observatory at Narrogin.

Operate accelerographs at Meckering and Kununurra and make field recordings of felt or damaging earthquakes and aftershocks. Study micro-earthquakes and wave attenuation in the southwest seismic zone. Make accelerograph and refraction recordings of large explosions. Study P-wave residuals and travel-times.

#### Toolangi Observatory, Vic

Record, analyse, and report on geomagnetic and seismic observations and continue normal SP recording at Bellfield, Norfolk Island, and Stephens Creek (NSW). Re-site the visual recording seismograph to Arthur's Seat on the Mornington Peninsula, south of Melbourne.

Standardise magnetometers used in Antarctica and train personnel destined for Antarctica in their use.

Operate the accelerograph in the Botanic Gardens and carry out field studies on felt or damaging earthquakes.

#### Regional gravity

Measure the absolute gravity at Darwin, Hobart, Port Moresby, Perth, and Sydney using the Soviet absolute gravity apparatus. Measure the intensity of earth tides at eight sites in Australia (in co-operation with the International Centre for Earth Tides and Australian organisations).

Use Soviet tilt apparatus to calibrate all available gravity meters in Australia. Outside organisations are invited to bring their meters to BMR for evacuation and calibration.

## Regional magnetics

Conduct fill-in third-order surveys in Yorke Peninsula, SA (Aug). Make third-order magnetic survey observations in Enderby Land, Antarctica (Jan-Feb).

Occupy first-order magnetic stations at the coast and at selected stations inland as part of the study of the secular variation of the Earth's magnetic field (Feb-Mar). Analyse high-altitude magnetic profiles gathered in 1975 and 1976 to determine characteristics of the regional and crustal magnetic anomaly fields.

EQUIPMENT AND SYSTEMS DEVELOPMENT PROGRAM

INTRODUCTION

The program for equipment and systems development involves upgrading and developing geophysical systems and techniques. New equipment is being designed, constructed, developed, and evaluated and existing techniques and equipment are being evaluated and modified to be suitable for Australian conditions. The work includes developing digital data acquisition and data processing systems which will assist data generation, manipulation, and interpretation.

Airborne systems

Upgrade the design of and construct an MFS-7 magnetometer. Construct radio altimeter test facilities, a Doppler digitiser, and a timer. Install a new camera intervalometer, Facit cassette recorder and interface an eight-channel digital-to-analogue converter to the Hewlett-Packard computer in the Twin Otter.

Find areas suitable for the calibration of airborne spectrometers.

Crustal studies systems

Continue developing the Akai automatic seismic tape recording and playback systems, and, if a feasibility study recommends it, modify the Telseis telemetry system for use in regional structural surveys.

Create a data library on a HP2100 computer system and store on it retrieval, signal processing, and plotting programs.

## Digital seismic systems

Prepare computer programs for processing digital seismic data through BMR Hewlett-Packard mini-computers and CSIRO's Cyber 76. Complete reports on seismic techniques.

## Down-hole EM methods

Develop an omni-directional probe for a multi-frequency Turam-type system. Carry out analogue and numeric model studies to assist development of the system and of interpretation methods.

## Drilling fluids

Test and evaluate materials and additives for use in drilling muds for rotary drilling.

## Geotechnical systems

Install and test computer-controlled seismic refraction/reflection equipment and integrate a data acquisition system for seismic refraction work.

Develop seismic techniques with a repetitive, non-explosive energy source.

Field test the applicability of a high-frequency EM technique to locate cavities between boreholes.

Investigate the feasibility of using a continuously recording, vertical force magnetometer in areas of high remanent magnetisation and changing magnetic inclination.

Construct a down-hole gamma-ray spectrometer.

Construct a trailer-mounted bore pump flow test unit for hydrological studies.

#### Geothermal systems

Design and construct heat flow logging equipment and needle probes.

#### Marine exploration systems

Develop an IP/resistivity and a radiometric system to detect and delineate offshore heavy-mineral sands.

#### Marine survey systems

For the prototype marine data acquisition system, design and construct amplifier/filter units, timing control units, a digital sender and receiver unit, and digital-to-analogue converters. Design and integrate the system.

Develop software to acquire and process digital magnetic, gravity, bathymetric, and navigation data. Develop a digital seismic acquisition system.

Continue development of the shallow-marine seismic profiling system.

#### Observatory systems

Maintain, test, develop, and construct equipment for seismic and magnetic observatories. Projects include constructing data acquisition systems for use with proton precession magnetometers in Antarctica, designing and constructing amplifier/filters, and installing and testing proton precession magnetometers.

#### Palaeomagnetic systems

Develop computer software for the joint BMR-ANU-CSIRO palaeomagnetic laboratory, and construct an alternating frequency demagnetiser.

Build a portable diamond drill for coring hard rock.

#### Radiometric methods

Investigate radon techniques of uranium exploration.

#### Transient EM method

Liaise with Mineral Research Laboratories, CSIRO, on developments of a new instrument.

## GEOTECHNICAL SERVICES AND HYDROGEOLOGY PROGRAM

### INTRODUCTION

Multidisciplinary studies employing geology, geophysics, groundwater hydrology, and rock and soil mechanics are used to aid civil engineering projects. Activities include investigation of sites for reservoirs, dams, major buildings and refuse disposal, and surveys of routes of tunnels, sewers, pipelines and roads. Complementing this work is the compilation of engineering geological maps of Canberra and investigation of soil properties.

Geological, geophysical, chemical, and hydraulic surveys and interpretative studies of the occurrence, distribution, composition, and hydraulic behaviour of groundwater provide the basis for water resource assessment and management.

### ENGINEERING GEOSCIENCE

#### Damsite and reservoir investigations

Geologically appraise, and conduct geophysical investigations of alternative damsites and treatment plant sites for the Tennent Dam.

Provide geological services during construction of the Googong Dam and ancillary works.

Undertake geotechnical investigations surveys at South Taylor 2 and Wanniasa 2 reservoirs, Mugga Pump Station, Tuggeranong Hill Offtake-Tuggeranong Hill 3, Jerrabomberra Creek-Deakin Reservoir, and Stromlo-Higgins bulk supply mains.



## Environmental and pollution studies

Investigate alternative landfill sites for refuse disposal in Tuggeranong. Conduct hydrogeological investigations of operating and disused landfill sites for refuse disposal, and establish leachate monitoring systems.

## Urban and regional development

Conduct site investigations, map excavations, and provide geological advice as required for major buildings.

Provide geological and geophysical services and make general assessments for Department of Construction and NCDC on the routes for Ginninderra sewer tunnel, Canberra trunk sewer, Canberra City sewer connection to trunk sewer, and Tuggeranong sewer connections.

Conduct preliminary geotechnical studies of rapid transit routes, and major roads and bridges in Canberra. Provide geological advice during construction of the Molonglo Parkway.

Map excavations in development areas of Canberra, evaluate potential resources of construction materials, and record vibrations produced by blasting or other sources.

Supervise the project geologist during the investigation of the design of the Telecom tunnels in Melbourne.

Conduct research in the Canberra and Albury-Wodonga areas into defining a soil stratigraphy, and into engineering properties of soil stratigraphic units.

Map the resistivity of the soil and weathered rock layers in the ACT to provide locations for earth connections (requested by Telecom and the ACT Electricity Authority).

Compile 1:10 000 engineering geological maps of central Canberra, Woden/Weston Creek, and south Canberra. Complete detailed geological mapping of the Sutton-Gundaroo area.

#### HYDROGEOLOGY

##### Australian Capital Territory and environs

Prepare a 1:100 000 scale hydrogeological map of the ACT and surrounding area.

Investigate the hydrogeology of part of the Yass River catchment at Kowen Forest in conjunction with CSIRO, and groundwater at Duntroon to determine if reclaimed water can be re-used.

Maintain, monitor, and analyse data from observation bores in the ACT and environs and Jervis Bay. Monitor the level and quality of water in Lake George.

Monitor piezometers near Lanyon and Isabella Plains to assess the effectiveness of drainage works. Investigate groundwater seepage problems in the West Murrumbidgee suburbs.

Participate in pollution studies including the compilation of a report on Molonglo River pollution.

##### Christmas Island

Interpret and report on the results of the 1976 geophysical survey.

##### Great Artesian Basin

Continue analysing hydrogeological data on the basin and refine the mathematical model of its hydraulic and groundwater characteristics. The Australian Water Resources

Council nominated BMR as the co-ordinating body for this project which is drawing on information held by BMR and relevant State Water Authorities and Mines Departments.

#### Murray-Goulburn

Review past geophysical work and recently acquired geological, geophysical, and drilling data to define avenues of further investigations. Work is likely to include investigation of the use of IP to resolve saline and clay low-resistivity zones; seismic, and deep resistivity depth-probe surveys; and experimental high-resolution seismic surveys to locate thin sandy aquifers.

#### Rutherglen-Albury

Conduct a resistivity survey to monitor changes in groundwater flow patterns resulting from the development of Albury-Wodonga.

FOREIGN AID PROGRAM

Advice to committees

Advise the East Asian and South Pacific Committees for the Co-ordination of Joint Prospecting for Mineral Resources in Offshore Areas, CCOP(EA) and CCOP(SOPAC) respectively.

Fiji

Provide technical advice on the location and construction of a sewerage tunnel to be driven under Suva, and damsites for Suva's water supply.

Irian Jaya

Carry out reconnaissance geological mapping to provide basic information on the geology and mineral resource potential.

Papua New Guinea

Provide specialised drafting and analytical services to the Geological Survey of Papua New Guinea.

Training courses

Provide in-house training to students under the Colombo Plan, UNDP, and Australian and PNG Education and Training Schemes. Lecture at the Industrial Mobilisation Course on behalf of the Department of Defence, and the International Training Course on Mineral Exploration for the Australian Development Assistance Bureau.

## INFORMATION SYSTEMS AND REFERENCE COLLECTIONS PROGRAM

### INTRODUCTION

Information is disseminated to the public and industry through the BMR series of publications, 'open file' system of unpublished data, reference collections, data indexes, inter-library loan service, and the production of national maps summarising existing knowledge. Petrological, mineralogical, and palaeontological reference collections are maintained for use by BMR and other organisations.

### INFORMATION SERVICES

#### Information dissemination

Prepare and disseminate information to government, industry, the public, and the news media; answer queries from government Ministers, Parliament, other Authorities, and the public as required.

Prepare the BMR Annual Report, Pictorial Index of Activities, List of Maps, List of Geoscience Events, List of Consultants, and Open File Circulars for distribution; organise the annual BMR Symposium and other various lectures and displays. Co-ordinate, index, and maintain the BMR photograph collection.

Continue feasibility studies on information storage and retrieval systems for BMR. Provide specialist advice and co-ordinate storage of technical material.

Maintain an overview of national and international geoscience information systems. Assist with the Australian Thesaurus of Earth Sciences and the Australian Earth Sciences Information System.

## Library

Maintain and operate a comprehensive library for use by BMR personnel and visitors.

## Stratigraphic Index

Maintain the Central Register of Stratigraphic Names. Send lists of variations to State Geological Surveys and other interested organisations.

## Technical Files

Maintain indexes and technical data files for use by BMR personnel.

## NATIONAL MAPS

### Atlas of Australian Resources

Compile a 1:5 million geological map of Australia.

### BMR Earth Science Atlas

Compile 1:10 million maps of Australia of: solid geology, main rock types, Cainozoic thickness and weathering, surface drainage and continental margins, and tectonic elements.

## International commitments

Organise the compilation of the Metallogenic Map of Oceanic for the Commission for the Geological Map of the World.

Compile a 1:10 million map, at standardised projection and reference, of the geology of Australia.

## REFERENCE COLLECTIONS

### Core and Cuttings Laboratory

Receive, catalogue, and store drill core and cuttings;  
provide facilities for examination and testing of samples.

### Museum

Maintain and operate a comprehensive museum of geological material; provide informational and educational services to the public, government, and teaching organisations.  
Arrange exchange or purchase of desirable specimens.

### Palaeontological Collection

Collect samples for and curate BMR and ESCAP fossil collections.

ADMINISTRATIVE AND TECHNICAL SERVICES

Administrative services

Provide support for projects where required.

Automatic data processing

Provide ADP facilities and advice for BMR activities. Present projects include development of computer assisted cartography, palaeomagnetic data acquisition system, information storage and retrieval systems using the IMAGE data base software package, and interactive editing and COM output of reports.

Drafting

Provide drafting services for projects.

Drilling

Undertake shallow-stratigraphic and shot-hole drilling.

Editing

Edit BMR publications and papers for scientific journals. Produce the BMR Journal of Australian Geology and Geophysics.

Laboratories

Calibrate and maintain equipment. Support projects as required.



Photogeology and remote sensing

Assist field parties in the interpretation of aerial photographs.

Investigate satellite imagery and review possible BMR participation in Landsat C.

Planning and co-ordination

Review and investigate short and long term program proposals in terms of priorities, manpower requirements, financial resources, cost effectiveness, and co-ordination of interrelated projects.

Provide secretariat services to the BMR Review Committee.

## APPENDIX

### PUBLICATIONS IN PROGRESS

Authors: Superscripts after an author's name indicate the following:

1. Formerly with BMR
2. With, or formerly with, State Geological Survey
3. With, or formerly with, university or other institution.

RECONNAISSANCE PROGRAM

<u>Project</u>	<u>Title (Publication)</u>	<u>Author</u>
GEOLOGICAL SURVEYS		
Antarctica	Geology of the Prince Charles Mountains, Antarctica (Bulletin)	Tingey, R.J. Sheraton, J.W.
	Prince Charles Mountains (1:500 000 map 1st ed.)	Tingey, R.J.
Bonaparte Gulf	Geology of the Bathurst and Melville Islands (Bulletin No. 177)	Hughes, R.J.
	Cobourg Peninsula - Melville Island (1:500 000 maps 1st ed.)	Hughes, R.J.
Burdekin River Region	Burdekin River Region (1:500 000 map 1st ed.)	Paine, A.G.L. Levingston, K. <sup>2</sup>
Canning Basin	The geology of the Fairfield Group, Canning Basin, WA. (Bulletin No. 200)	Druce, E.C. Radke, B.M.
	Late Devonian and Early Carboniferous geology of the Lennard Shelf, Canning Basin, WA. (Bulletin)	Druce, E.C. Radke, B.M. Nicoll, R.S.
	Upper Devonian and Lower Carboniferous Conodonts from the Fairfield Group, Canning Basin, WA. (Bulletin)	Nicoll, R.S. Druce, E.C.
	Upper Devonian Conodonts from the Oscar and Napier Ranges, Canning Basin, WA. (Bulletin)	Nicoll, R.S.
	Geochemistry of the Fairfield Group, Canning Basin, WA. (Report No. 202)	Druce, E.C. Radke, B.M.
	Mount Bannerman (1:250 000 map 2nd ed.)	Yeates, A.W. Muhling, P. <sup>2</sup>
Noonkanbah	" " "	Towner, R. Crowe, R. <sup>2</sup>

ProjectTitle (Publication)Author

Tabletop (1:250 000 map 2nd ed.) Yeates, A.N.

Cornish " " " Crowe, R.<sup>2</sup>

Derby, Mount Anderson (1:250 000 maps 2nd ed.) Towner, R.  
Gibson, D.  
Crowe, R. <sup>2</sup>

Helena, Sahara (1:250 000 maps 1st ed.) Yeates, A.N.

Crossland, Ryan, Wilson, Ural ( " " " ) Towner, R.

Morris, Runton ( " " " ) Crowe, R.<sup>2</sup>

Dummer (1:250 000 map 1st ed.) Wyborn, D.A.<sup>1</sup>

Carpentaria Basin Geology of the Carpentaria Basin, Qld. (Bulletin) Douth, H.F.  
Smart, J.  
Grimes, K.<sup>2</sup>

The Mesozoic Carpentaria and Cainozoic Kurumba Basins, Qld. (Bulletin) Smart, J.  
Grimes, K.<sup>2</sup>  
Douth, H.F.  
Pinchin, J.

Northern Carpentaria (1:1 000 000 map 1st ed.) Smart, J.

Southern Carpentaria ( " " " ) Douth, H.F.  
Smart, J.

Cape Weymouth, Coen, Croydon, Ebagooola (1:250 000 maps 1st ed.) Douth, H.F.

Holroyd, Mornington Island - Cape Van Dieman ( " " " ) Grimes, K.<sup>2</sup>

Jardine River, Orford Bay, Red River ( " " " ) Smart, J.

Torres Strait (1:250 000 map 1st ed.) Willmott, W.F.<sup>2</sup>  
Powell, B.S.<sup>1</sup>

<u>Project</u>	<u>Title (Publication)</u>	<u>Author</u>
Eromanga Basin	Notes on the geology of the Eromanga Basin. (Bulletin No. 167)	Senior, B.R. Mond, A. Harrison, P.L.
	Northern Eromanga Basin (1:1 000 000 map 1st ed.)	Senior, B.R.
	Northwestern Eromanga Basin ( " " " )	Mond, A.
Granites-Tanami	Geology of the Granites-Tanami area, NT and WA. (Bulletin)	Blake, D.H. Hodgson, I.M. <sup>2</sup> Muhling, P.C.
	Granites-Tanami ( 1:500 000 map 1st ed.)	Hodgson, I.M.
	Lucas ( 1:250 000 map 2nd ed.)	Crowe, R.W.A. <sup>2</sup> Muhling, P.C. <sup>2</sup>
	Billiluna ( " " " )	Muhling, P.C. <sup>2</sup> Passmore, V.L. Blake, D.H.
	Stansmore ( " " " )	Blake, D.H. Yeates, A.N.
	Tanami, Highland Rocks ( 1:250 000 map 1st ed.)	Hodgson, I.M.
McArthur Basin	Geology of the Carpentaria Proterozoic Province: Arnhem Land, NT (Bulletin)	Plumb, K.A. Roberts, H.G.
	Evolution of the McArthur Basin, NT. ( " )	Plumb, K.A. Roberts, H.G.
Ngalia Basin	The geology and geophysics of the Ngalia Basin, NT. ( " )	Wells, A.T. Moss, F.J.
Officer Basin	Geology of the Officer Basin, WA. ( " )	Jackson, M.J. Van de Graaff, W.J.E. <sup>2</sup>

# RECONNAISSANCE SURVEYS

<u>Project</u>	<u>Title (Publication)</u>	<u>Author</u>
	Officer Basin seismic, gravity, magnetic and radiometric surveys, WA. 1972 (Report No. 191)	Harrison, P.L. Zadoroznyj, I.
	Minigwal ( 1:250 000 map 1st ed.)	Boegli, J.C. <sup>2</sup>
	Cundeelee ( " " " )	Van de Graaff, W.J.E. <sup>2</sup>
	Flumridge ( " " " )	Van de Graaff, W.J.E. <sup>2</sup> Bunting, J.H.
	Lennis, Kingston, Waigen, Throssel ( 1:250 000 maps 1st ed.)	Jackson, M.J.
Papua New Guinea (pre-Independence reconnaissance program commitments)	Geology of New Ireland (Bulletin No. 194)	Hohnen, P.D.
	Geological synthesis of Papua New Guinea (Bulletin No. 201)	Dow, D.B.
	Geology of the North Sepik region, PNG. (Bulletin)	Hutchison, D.S. Norvick, M.S.
	Volcanoes of the Papua New Guinea Highlands( " )	Mackenzie, D.E.
	Bagana Volcano, Bougainville Island, PNG. ( " )	Bultitude, R.J.
	Stratigraphic tables, Papua New Guinea. (Report No. 193)	Skwarko, S.K.
	New Britain ( 1:500 000 map 1st ed.)	Ryburn, R.J. Mackenzie, D.E.
	May River ( 1:250 000 map 1st ed.)	Hutchison, D.S. Davies, H.L.
	Aitape-Vanimo, Wewak, Sepik. ( 1:250 000 maps 1st ed.)	Hutchison, D.S. Norvick, M.S.
Papua New Guinea (PNG funded)	Port Moresby-Kalo-Aroa, Kikori ( 1:250 000 maps 1st ed.)	Pieters, P.E.

<u>Project</u>	<u>Title (Publication)</u>	<u>Author</u>
Wiso Basin	The geology of the Wiso Basin. (Bulletin)	Kennewell, P.J., Huleatt, M.B.
	Winnecke Creek, South Lake Woods, Tanami East ( 1:250 000 maps 1st ed.)	Kennewell, P.J., Huleatt, M.B.
	Green Swamp Well, Lander River ( 1:250 000 maps 1st ed.)	Kennewell, P.J.
	Mount Solitaire ( 1:250 000 map 1st ed.)	Kennewell, P.J. Offe, L.A.
Yilgarn Block	Leonora, Yalgoo, Laverton ( 1:250 000 maps 1st ed.)	
AIRBORNE SURVEYS	Magnetic: Alcoota, Alligator River, Ballarat, Broken Hill, Canberra, Cape Scott, Cloncurry, Cobourg Peninsula, Cundeelee, Darwin, Fog Bay, Georgetown, Melville Island, Minigwal, Mount Evelyn, Pine Creek, Plumridge, Rason, Red River, Saint Arnaud, Wagga Wagga, Westmoreland ( 1:250 000 maps 1st ed.)	
	Alice Springs (NW quarter), Bairnsdale, Bega, Bentley, Browne, Cooper, Cootamundra, Duchess, Dumbleyung, Hermannsburg (northern half), Hyden, Katherine, Lake Mackay, Lennis, Mallacoota, Mount Doreen, Mount Evelyn (southern half), Mount Peake, Napperby, Newdegate, Scott, Talbot, Ulladulla, Waigen, Westwood, Yowalga (1:250 000 maps Prelim. ed.)	
	Radiometric: Alice Springs (NW quarter), Cootamundra, Duchess, Dumbleyung, Hermannsburg (northern half), Hyden, Katherine, Lake Mackay, Mount Doreen, Mount Evelyn (southern half), Mount Peake ( 1:250 000 maps Prelim. ed.)	
	Magnetic: Broken Hill (6 1: 50 000 maps 1st ed.)	
Amadeus Basin	Amadeus Basin magnetic and radiometric survey, NT, 1965. (Report No. 187)	Young, G.A. Shelley, S.P.
Eucla Basin	Airborne Survey 1970-3, Eucla Basin, SA. (Bulletin)	Lambourn, S.S. <sup>1</sup>
MARINE GEOLOGY	Marine geology of the Capricorn Channel area. (Bulletin No. 163)	Marshall, J.F.

<u>Project</u>	<u>Title (Publication)</u>	<u>Author</u>
East and southeast Australian Shelf, and Bass Strait	Marine geology of the continental shelf off southeast Australia. (Bulletin No. 195)	Davies, P.J.
	Marine geology of the Tasmanian Shelf. (Bulletin)	Davies, P.J.
	Marine geology of the central NSW Shelf. ( " )	Marshall, J.F. Jones, H.A.
	Central and southern Continental Shelf of NSW. ( 1:1 000 000 map 1st ed.)	Davies, P.J.
<b>MARINE GEOPHYSICS</b>		
Continental Margins	The Exmouth Plateau: stratigraphy, structure, and petroleum potential. (Bulletin)	Willcox, J.B. Exon, N.F.
	Geophysical results from the Great Australian Bight. (Report No. 201)	Willcox, J.B.
	Regional geology of the Carnarvon Terrace. (Report)	Symonds, P.A. Cameron, P.J.
	Regional geology of the Ceduna Terrace. (Report)	Exon, N.F. Stagg, H.M.J.
	Naturaliste Plateau: Sediment distribution and structure. (Report)	Cameron, P.J. Petkovic, P.
	GRAVITY	Gravity surveys of Western Australia and the west of South Australia. (Bulletin)
A qualitative analysis of the results of the reconnaissance gravity survey of Australia. (Report)		Fraser, A.R.
BMR ADP gravity data storage and retrieval system. (Report)		Murray, A.S.
Gravity Map of Australia (1:12 000 000 map 1st ed.)		
Gravity Map of Melanesia ( 1:5 000 000 map 1st ed.)		
	Free-air Gravity Map of Australia ( 1:2 500 000 map Prelim. ed.)	



PETROLEUM RESOURCES PROGRAM

<u>Project</u>	<u>Title (Publication)</u>	<u>Author</u>
BASIN REVIEW AND RESOURCE ASSESSMENT		
Basin Review	Canning Basin Atlas	
BASIN SURVEYS		
Officer Basin	Officer Basin seismic, gravity, magnetic and radiometric surveys, WA, 1972. (Report No. 191)	Harrison, P.L. Zadoroznyj, I.
Surat Basin	Palynology and stratigraphy of the Early Cretaceous in the Surat Basin, Qld. (Bulletin)	Burger, D.
PETROLEUM TECHNOLOGY	Preliminary analysis of Australian crude oils. (Report No. 181)	Powell, T. <sup>1</sup>
	An integrated scheme for the laboratory analysis of oil, natural gas and petroleum. (Report No. 197)	McKirdy, D.E. Horvath, Z.
PALAEONTOLOGY	Cambrian and Ordovicianostroconch molluscs from northern Australia. (Bulletin No. 171)	Gilbert-Tomlinson, J. Shergold, J.H. Pojeta, J. <sup>3</sup>
	Middle Cambrian Agnostacea. (Bulletin No. 172)	Opik, A.A.
	Australian Ordovician Pelycpod molluscs. (Bulletin No. 174)	Gilbert-Tomlinson, J. Pojeta, J. <sup>3</sup>
	Dolichometopid trilobites. (Bulletin No. 175)	Opik, A.A.
	Microfossils of fungal origin from Tertiary sediments on the Ninetyeast Ridge.	Kemp, E.H.
	Palaeocene and Eocene nannofossils from the Kings Park Formation, Perth Basin, WA.	Shafik, S.
	Relation of Mournalonia and Ptychemphalina Upper Palaeozoic Gastropoda.	Dickens, J.M.
	The genus Triplasia (Foraminiferida) from the Miocene of Papua New Guinea. (Crespin Volume - Bulletin No. 192)	Belford, D.J.

A-7

PETROLEUM RESOURCES PROGRAM

<u>Project</u>	<u>Title (Publication)</u>	<u>Author</u>
	Studies of larger foraminifera from Oligo-Miocene Sediments from west WA. (Bulletin)	Chaproniere, G.C.H.
	Late Cambrian trilobites from the Chatsworth area, western Qld. (Bulletin)	Shergold, J.H.
	Bathriolepid antiarchs from Victoria Land, Antarctica. (Bulletin)	Young, G.C.
	Dromornithidae, a family of large extinct ground birds endemic to Australia. (Bulletin)	Vickers-Rich, E. <sup>3</sup>
	Check list of Ostracoda recorded from Australia and PNG. (Report No. 195)	De Dekker, P. <sup>3</sup> Jones, P.

MINERAL RESOURCES PROGRAMProjectTitle (Publication)Author

## PROVINCE STUDIES

Arunta Block	Geology of the northwest Arunta Block, NT. (Bulletin)	Stewart, A.J. Offe, L.A. Warren, R.G. Glikson, A.Y.
	Results of 1:100 000 scale mapping of the southeastern Arunta Block, NT. (Bulletin)	Shaw, R.D. Langworthy, A.D. Offe, L.A. Stewart, A.J. Warren, R.G.
	Petrographic and geochemical study of the Ringwood evaporite deposits, NT. (Report No. 186)	Stewart, A.J.
Mount Peake	(1:250 000 map 1st ed.)	Stewart, A.J. Offe, L.A.
Mount Peake	( 1:100 000 map 1st ed.)	Stewart, A.J. Offe, L.A.
Hermannsburg	( " " " )	Shaw, R.D.
Laughlen	( " " " )	Stewart, A.J. Langworthy, A.P.
Alice Springs, MacDonnell Ranges	(1:100 000 maps Prelim. ed.)	Offe, L.A.
Undoolya	(1:100 000 map 1st ed.)	Shaw, R.D. Offe, L.A.
Riddoch	( " " " )	Stewart, A.J.
Fergusson Range	( " " " )	Shaw, R.D. Stewart, A.J.
Aileron	( " " " )	Glikson, A.Y. Warren, R.G.

MINERAL RESOURCES PROGRAM

<u>Project</u>	<u>Title (Publication)</u>	<u>Author</u>
	Denison	(1:100 000 map 1st ed.) Stewart, A.J. Offe, L.A.
Georgetown Block	Isotopic ages of rocks from the Georgetown-Mount Garnet-Herberton area, north Queensland.	(Report No. 200) Black, L.P.
	Forsayth	(1:100 000 map 1st ed.) Bain, J.H.C.
	Georgetown, Gilberton	(1:100 000 maps Prelim. ed.) Oversby, B.S. Withnall, I.W. <sup>2</sup> Bain, J.H.C.
Georgina Basin	Annotated bibliography of the Georgina Basin	(Report) Druce, E.C. Shergold, J.H.
	Burke River Structural Belt	(1:100 000 map 1st ed.) Druce, E.C. Radke, D.E.
Lachlan Belt	Brindabella, Tantangara	(1:100 000 maps 1st ed.) Owen, M. Wyborn, D.
Nicholson-Mount Isa Belt		
Duchess	Duchess, Malbon, Oban, Galloway, Dajarra	(1:100 000 maps Prelim. ed.) Bultitude, R.J.
Lawn Hill	Lawn Hill	(1:250 000 maps 2nd ed.) Grimes, K. <sup>2</sup>
	Mount Oscar	(1:100 000 map Prelim. ed.) Sweet, I.P.
	Musselbrook, Bowthorn	(1:100 000 maps Prelim. ed.) Mond, A.
Mount Isa-Cloncurry	Geology of the Mary Kathleen 1:100 000 Sheet area, northwest Qld. (Bulletin No. 193)	Derrick, G.M. Wilson, I.H. Hill, R.E. Glikson, A.Y. Mitchell, J.F.

MINERAL RESOURCES PROGRAM

<u>Project</u>	<u>Title (Publication)</u>	<u>Author</u>
	Geology of the Marraba 1:100 000 Sheet area. (Report)	Derrick, G.M. Wilson, I.H. <sup>2</sup>
	Geology of the Mount Isa 1:100 000 Sheet area, northwest Qld. (Report)	Hill, R.M. Wilson, I.H. <sup>2</sup>
	Cloncurry (1:250 000 map 2nd ed.)	Hill, R.M. Wilson, I.H. <sup>2</sup> Grimes, K. <sup>2</sup>
	Cloncurry, Marraba, Mount Isa (1:100 000 maps 1st ed.)	Derrick, G.M. Hill, R.M. Wilson, I.H. <sup>2</sup>
	Prospector (1:100 000 map 1st ed.)	Hill, R.M. Wilson, I.H. <sup>2</sup>
	Quamby (1:100 000 map Prelim. ed.)	Derrick, G.M. Hill, R.M. Wilson, I.H. <sup>2</sup>
Westmoreland	Westmoreland (1:250 000 map 2nd ed.)	Sweet, I.P. Grimes, K. <sup>2</sup>
	Mornington Island ( " " " )	Grimes, K. <sup>2</sup>
	Seigal, Hedley's Creek (1:100 000 maps 1st ed.)	Sweet, I.P. Mitchell, J.E. Gardner, C.M.
Fine Creek Block	Geology of the Alligator Rivers Uranium Field, NT. (Bulletin)	Needham, R.S. Stuart-Smith, P.G. Smart, P.G.

# MINERAL RESOURCES PROGRAM

<u>Project</u>	<u>Title (Publication)</u>	<u>Author</u>
	East Alligator, Junction Bay, Wellington Range, Alligator Rivers (1:100 000 maps 1st ed.)	Needham, R.S.
	Cahill, Jim Jim (1:100 000 maps Prelim. ed.)	Needham, R.S. <sup>1</sup> Smart, P.G.
	Howship, Cenpelli ( " " " )	Needham, R.S. <sup>1</sup> Smart, P.G. Watchman, A.L. <sup>1</sup>
	Gilruth (1:100 000 maps Prelim. ed.)	Needham, R.S.
	Field Island ( " " " )	Needham, R.S. <sup>1</sup> Watchman, A.L. <sup>1</sup>
	Kapalga ( " " " )	Stuart-Smith, P.G. Smart, P.G. <sup>1</sup>
	Rum Jungle Special ( " " " )	Johnson, K. <sup>1</sup>
	Batchelor ( " " " )	Crick, I.H.
Tennant Creek	Geochemistry of the Tennant Creek Mineral Field (Bulletin)	Smith, S.E. Haldane, A.D.
	Tennant Creek (1:250 000 map 1st ed.)	Dodson, R.L. Rendum, J.
ORL GENESIS AND MINERAL CONTROLS	Geochemistry and petrology of acid igneous rocks from northeast Queensland. (Bulletin No. 169)	Sheraton, J.W. Labonne, B. <sup>1</sup>
	Indexes to analyses of calcium and magnesium carbonate rocks (Bulletin No. 176)	Joplin, G.A. <sup>3</sup>
	Evaporites in Australia (Bulletin)	Wells, A.T.

MINERAL RESOURCES PROGRAM

<u>Project</u>	<u>Title (Publication)</u>	<u>Author</u>
Mineral Sands	Sedimentation in a tropical estuary, Broadsound, Qld. (Bulletin No. 170)	Cook, P.J. Mayo, W. 1
	Hydrology and sediments of a temperate estuary, Mallacoota Inlet, Victoria. (Bulletin No. 178)	Reinson, G.E.3
	Geochemistry of a tropical estuary, Broadsound, Qld. (Bulletin No. 182)	Cook, P.J. Mayo, W. 1
	A bibliography of Australian heavy mineral sands. (Report)	Gardiner, J. 1
	Geology and petrology of the Taber, Lihir Tanga, and Fenj Islands off New Ireland, PNG. (Bulletin)	Johnson, R.W. Wallace, D.A. Ellis, D.J. Crick, I.H.
Volcanology and Ore Genesis	Distribution and major element chemistry of Late Cainezoic volcanoes of the Southern Margin of the Bismarck Sea, PNG. (Report No. 188)	Johnson, R.W.
MINERAL ECONOMICS	Australian Mineral Industry 1975 annual Review	
	Australian Mineral Industry Quarterly, Vol. 29 No. 2	
	" " " " " " 3	
	" " " " " " 4	
	" " " " " 30 " 1	

EARTH STRUCTURE AND PHYSICAL PROPERTIES PROGRAM

CRUSTAL STUDIES

Gosses Bluff	Gosses Bluff geological and geophysical studies. (Bulletin)	Moss, F.J. Milton, D.3
	Gosses Bluff gravity survey, 1968-69. (Report)	Barlow, B.C. Van Son, J.H.

A-13

EARTH STRUCTURE AND PHYSICAL PROPERTIES PROGRAM

<u>Project</u>	<u>Title (Publication)</u>	<u>Author</u>
<u>GEOPHYSICAL OBSERVATORIES</u>		
Canberra Observatory	Analysis of the diurnal variation of the Earth's magnetic field. (Bulletin No. 173)	Parkinson, W.D. <sup>1</sup>
	Catalogue of earthquake focal mechanisms for the western Pacific and Melanesian regions. (Bulletin)	Denham, D.
PNG Observatory (commitments prior to transferral)	Catalogue of tsunamis for the New Guinea-Solomon Islands region, 1968-72. (Report No. 180)	Everingham, I.B.
	An analysis of strong-motion accelerograms from Yonki, PNG, 1967-72. (Report No. 184)	Denham, D.
	Earthquake focal mechanisms in the New Guinea/Solomon Island region, 1969-71. (Report No. 192)	Ripper, I.D.
	Seismicity of the New Guinea/Solomon Islands region, 1969. (Report No. 199)	Everingham, I.B.
Regional Gravity	Seismic and gravity investigations along the Geotraverse, N.A. 1969. (Bulletin No. 191)	Mather, S.P. Ross, F.J. Branson, J.C.
	Australian gravity network adjustment 1975. (Bulletin)	McCracken, H.M.

EQUIPMENT AND SYSTEMS DEVELOPMENT PROGRAM

Airborne Systems	Digital data acquisition system in geophysical survey aircraft VH-BMG. (Report No. 185)	Downie, D.W.
------------------	--	--------------



## GEOTECHNICAL SERVICES AND HYDROGEOLOGY PROGRAM

### ENGINEERING GEOSCIENCE

Urban and Regional Development	Engineering geology of the proposed Darwin East urban development area, N.T. (Bulletin)	Vandenbroek, P.H.
	Terrain classification of Canberra (1:100 000 map 1st ed.)	Wilson, E.G.
	Central Canberra, Moden-Weston Creek (1: 10 000 engineering geology maps)	Henderson, G.A.M.
HYDROGEOLOGY	Recharge conditions and the siting of bores in fractured rock aquifers of the ACT. (Report No. 173)	Burton, G. <sup>1</sup>

## INFORMATION SYSTEMS AND REFERENCE COLLECTIONS PROGRAM

INFORMATION DISSEMINATION Geological Branch Summary of Activities, 1976. (Report No. 196)

NATIONAL MAPS	Notes to accompany the geological map of the Northern Territory. (Bulletin No. 180)	D'Addario, G.
	Notes to accompany the geological map of Australia 1:2.5M (Bulletin No. 181)	D'Addario, G.