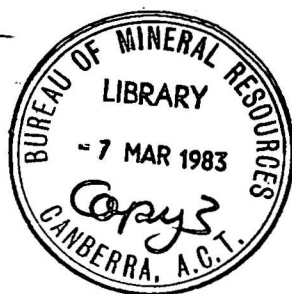


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# BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

## RECORD

RECORD 1982/43

### MURRAY BASIN HYDROGEOLOGICAL PROJECT

#### PROGRESS REPORT 8

for half year ending 30 September 1982

compiled by

W.J. Perry

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RECORD 1982/43

MURRAY BASIN HYDROGEOLOGICAL PROJECT

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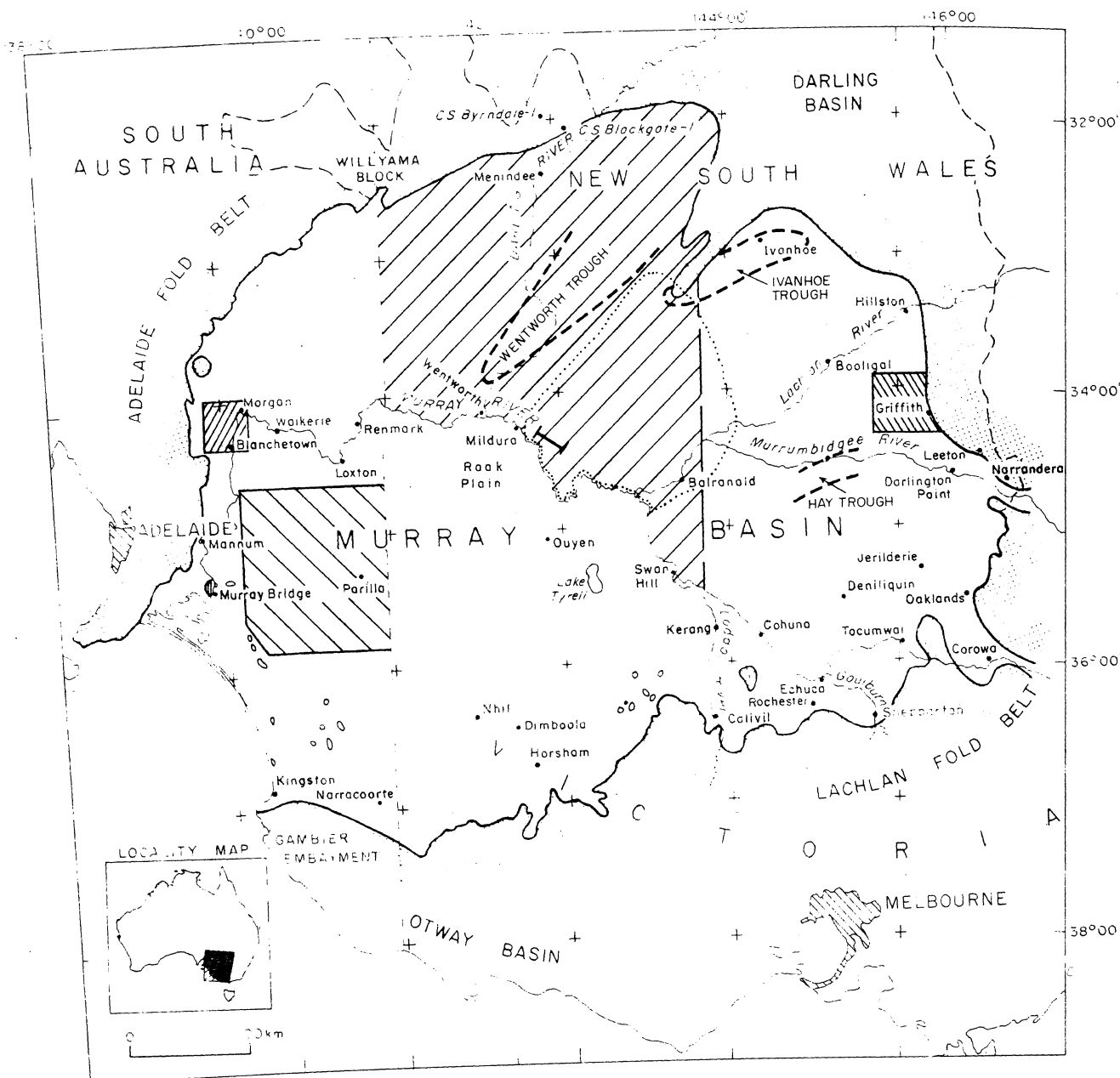
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## TABLE OF CONTENTS

|   | <u>Page</u> |
|---|-------------|
| INTRODUCTION  | 1           |
| PROGRESS REPORTS  | 1           |
| WATER RESOURCES COMMISSION OF NEW SOUTH WALES   | 1           |
| SOUTH AUSTRALIAN DEPARTMENT OF MINES AND ENERGY   | 2           |
| GEOLOGICAL SURVEY OF NEW SOUTH WALES  | 3           |
| GEOLOGICAL SURVEY OF VICTORIA   | 4           |
| BUREAU OF MINERAL RESOURCES   | 5           |
| RECENTLY PUBLISHED AND UNPUBLISHED REPORTS ON THE<br>GEOLOGY AND HYDROGEOLOGY OF THE MURRAY BASIN     | 7           |
| APPENDIX - General Statement - Murray Basin<br>Hydrogeological Project                                |             |
| FIGURE 1 - LOCALITY DIAGRAM   |             |
| FIGURE 2 - PLOTTING OF BOREHOLE LOCALITIES AND<br>TABULATION OF DOWNHOLE STRATIGRAPHIC<br>INFORMATION |             |



(Based on 19/A/10)

#### WRC NSW

-  Water sampling
-  Re-interpretation of old seismic data
-  Proposed refraction seismic traverse
-  Seismic survey nearing completion

#### SADME





-  Rotary drilling suspended
-  Irrigation well survey.
-  Data assessment report in preparation
-  Cable tool drilling

Fig.1 Locality diagram

## INTRODUCTION

During the period under review progress with the first phase of the Project continued. Two items of interest, described in more detail in this report, are the start of IGCP Project 184 "Palaeohydrology of low latitude deserts", and BMR field work in the northwest New South Wales part of the Basin with the objective of adding more detail to the surface geology as depicted on existing 1:500 000 scale maps. The Steering Committee met in Melbourne on 10th June.

## PROJECT REPORTS

### WATER RESOURCES COMMISSION OF NEW SOUTH WALES

by

D.R. Woolley

#### 1. Drilling

There was no exploratory drilling during the period. No funds have been allocated for investigation drilling for 1982-83.

#### 2. Refraction Seismic Survey

Approximately 57 km of traverses were conducted in areas west and northwest of Griffith. Part of this work was to fill in gaps in earlier traverses, to enable a better assessment to be made of bedrock configuration in an area west of Griffith, where there are indications that a bedrock ridge may be having a local effect on water movement and salinity. The remainder was directed at establishing the geometry of the basin margin, to the northwest of Griffith in the general vicinity of Goolgowi. Because of staff shortages, the interpretation of field data is lagging behind their rate of acquisition.

#### 3. Mallee Cliffs Area

A large saline water inflow to the Murray River occurs over a short distance at this locality, and investigations are being conducted on both sides of the river with a view to reducing the inflow by installing shallow groundwater interception works. The reason for the high water table which is causing the saline inflow is not clear, but its coincidence with the south-westerly projection of a surface ridge thought to be the reflection of a

basement structure has led to the hypothesis that there may be some structural control. This possibility is being investigated by:-

- a) re-interpretation of refraction seismic data from traverses conducted some years ago by petroleum exploration groups, in the area northeast of Mildura and extending to the Basin margin;
- b) carrying out new seismic refraction traverses in the Mallee Cliffs area.

#### 4. Water Sampling

The water sampling program in the NSW part of the Basin west of Balranald continued.

#### 5. Water Level Recording

Monitoring of water levels continued in the Commission's observation bore network in the eastern part of the Basin.

#### 6. Reports

An internal report on carbon dating of water in the Darlington Point area was completed.

The first draft of a compilation of data in the lower Lachlan (Hillston) area was completed.

A draft has been prepared for the chapter on the eastern marginal areas of the NSW part of the Basin, for inclusion in the first (geological) joint report on the Project.

### SOUTH AUSTRALIAN DEPARTMENT OF MINES AND ENERGY

by

S.R. Barnett

The rotary investigation program has been suspended after 12 holes have been completed on the western margin. Cable tool drilling has commenced in Murray River floodplain just north of Murray Bridge to examine salinity profiles and head relationships close to the river. Very interesting results have so far been obtained.

Levelling of private and Departmental wells in the northwestern margin has been completed. Levelling close to the river south of Morgan has also been completed and suggests groundwater flow away from the river.

A survey of all large irrigation wells in the Murray Mallee has been completed and observation wells have been selected to monitor the regional water table as well as drawdown effects from a surrounding concentration of irrigation wells.

A final data assessment report covering the Murray Mallee is still in preparation.

An interdepartmental committee has met to discuss the observation networks in the Upper Murray area.

N.S.W. DEPARTMENT OF MINERAL RESOURCES

by

D.H. Probert

1. Coal Exploration Activity

(a) Murray Basin

The Coal Geology Branch has commenced a brief review of the northern section of the Murray Basin near Menindee. This review will concentrate on assessment of data from published reports, and from previous water, petroleum and uranium exploration. A report will be released in late 1982 or early 1983.

(b) Oaklands Infrabasin

A review of the geology and coal potential of the Oaklands Basin is currently in hand and it is expected that a comprehensive report will be available about the end of June, 1983.

(c) Pacific Coal Pty Ltd

Coal assessment is at an advanced stage in the company's authorisation area at Oaklands. The company has announced an examination of the feasibility of utilising the coal in a privately built power station in the area. Part of the continuing investigation is an examination of the feasibility of disposal of saline mine water by injection.

## 2. Petroleum Exploration Activity

During the period, three petroleum licences have been withdrawn. These covered the areas between the Hay, Ivanhoe and Wentworth Troughs. A further licence application centred around Deniliquin has been granted to Balhoil Nominees Ltd who have yet to advise of their formal program.

Meekatharra Minerals has produced a preliminary Landsat study of the Oaklands Basin area for PEL 231.

Comserv (No. 779) in association with ESSO continued work on their licences in the Menindee - Wentworth Troughs areas. Detailed aerogeochemical programs have been completed prior to delineation of seismic lines. Esso has proposed seismic work to be completed in early 1983 in these areas.

### GEOLOGICAL SURVEY OF VICTORIA

by

C.R. Lawrence

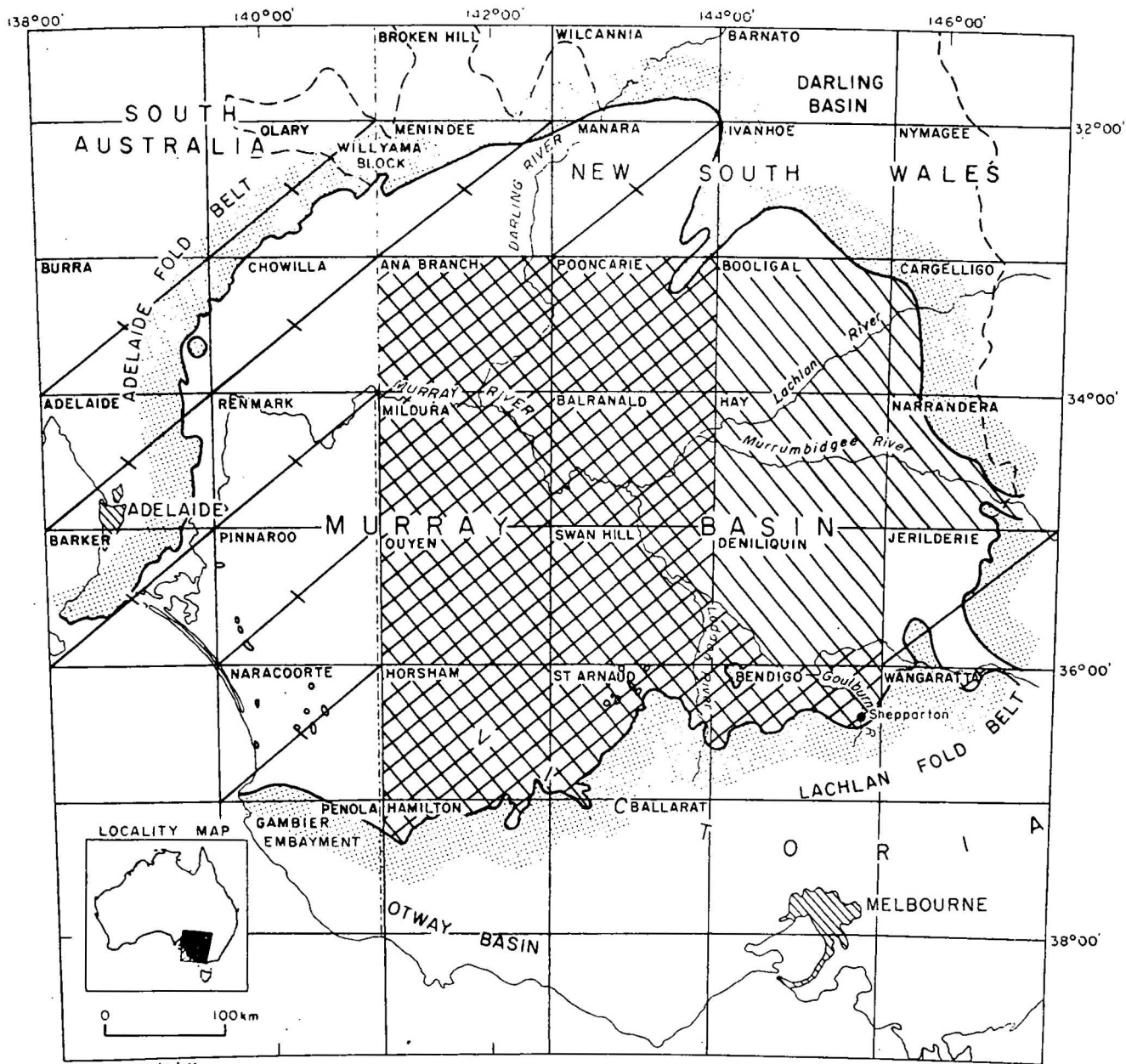
1. The Australian meeting of UNESCO-IGCP Project 184 "Palaeohydrology of low-latitude deserts" held August 11-27, 1982 included a 6-day excursion of the Murray Basin and a number of papers on groundwater of the Murray Basin.

The excursion included the irrigation districts of the Riverine Plain, where dewatering bores were examined, the natural groundwater discharge zones of Lake Tyrrell and Raak Plains, the history of Lake Mungo, especially in relation to man, paleosol sequences in aeolian deposits, sections through the Upper Cainozoic at river sections near Mildura, and large groundwater irrigation schemes near Darlington Point.

Nearly 60 participated in the meeting including 10 from overseas.

2. Many of the groundwater investigations taking place in the Victorian part of the Murray Basin are directly related to the salinity problem. This is because in the eastern part of the basin and in the highlands surrounding the basin there has been a progressive rise in the water table this century, and where it comes close to the surface and there is no effective drainage, salts are concentrated by evaporation and salinisation results.





(Based on 19/A/11)

- |  |   |
|--|---|
|  <i>In progress</i>             |  <i>Previously completed</i> |
|  <i>Completed during period</i> |  <i>To be revised</i>        |

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Fig. 2 Plotting of borehole localities and tabulation of downhole stratigraphic information

The group stationed at Shepparton is in the final stage of writing up a report on phase I of groundwater/salinity of the Victorian part of the Riverina Plain, including the publication of 1:250 000 hydrogeological map of Bendigo and Wangaratta.

A summary of their work to date and likely conclusions was presented at a seminar in Melbourne in September.

Preliminary evidence has also been presented by SRWSC and the Department of Minerals & Energy to the Parliamentary Salinity Committee Enquiry.

3. P. Macumber has completed a draft of a comprehensive report on the hydrogeology of the Loddon Valley and on the contemporary and palaeohydrology of the groundwater discharge zones of northwest Victoria, concentrating on Lake Tyrrell.

The report makes major advances in understanding the hydrochemistry and complicated and varying flow patterns within the vicinity of these discharge zones.

4. Computer modelling of the groundwater flow system of the Campaspe valley is being undertaken by R. Williamson. This detailed work is of special interest because the valley is considered the new major area prone to salting problems due to a rising water table, yet there are localised areas where clustering of irrigation bores has caused interference.

#### BUREAU OF MINERAL RESOURCES

by

C.M. Brown

Preliminary photo-interpretation of the Ana Branch, Pooncarie, Balranald, Menindee and parts of the Manara 1:250 000 geological map sheets was completed during the period, prior to a field survey conducted in the western NSW sector of the basin in August/September. Field compilation sheets at 1:100 000 scale will be reduced to 1:1 000 000 scale to allow completion of the geological map of the basin. Further photo-interpretation of parts of the Hay, Booligal, Deniliquin, Jerilderie and Narrandera Sheet areas will be undertaken in early 1983.

Several saline lake complexes located within topographic depressions (40ma.s.l.), were examined during the survey. They generally consist of gypsum-bearing lacustrine sediments of relict lake floors, entrenched within which are a number of small present day groundwater discharge playa lakes. The lakes are generally characterised by a layer of sulphate-reducing bacterial mud, however the chemical response of the overlying and underlying sediments appear to be sensitive to slight differences in elevation of lake floors. In places the sulphate-reducing bacterial mud is overlain by a pink algal-stained halite crust, elsewhere by gypsum and algal mats, or dessicated algal mats and powdery gypsite. The mud can be underlain by orange oxidised sand, dark gypsum-bearing lacustrine clays, ferricrete or silcrete hardpans. Groundwater discharge features include mounds of iron, silica and carbonate-cemented sand.

The Blanchetown Clay was not found to be as continuously extensive as previously thought. Relict occurrences were found at several localities along the Ana Branch and on the margins of some of the Ana Branch and Menindee lakes, however the relict lacustrine surfaces within the saline lake complexes and around most of the margins of the present day lakes are thought to be younger. Several morphologically distinct aeolian deposits were mapped. However younger dune systems, morphologically equivalent to the Lowan Sand of western Victoria, are not as lithologically distinct and in places are locally derived from and difficult to distinguish from underlying Woorinen Formation. Pliocene sand outcrops were examined along the Darling River and are interpreted as fluvial north of the Ana Branch-Menindee Sheet boundaries while further south relative sorting characteristics and trace fossils suggest a marine origin. A number of arcuate topographic ridges, which may represent former Pliocene beach-barrier bar complexes were investigated without success.

Work continued on the documentation of the regional distribution, depositional environments and geometry of lithostratigraphic units and major aquifer systems of the basin. Borehole data from the Cargelligo, Booligal, Narrandera, Deniliquin and Hay 1:250 000 Sheet areas, received from the Water Resources Commission of NSW, were transcribed during the period. The recent revisions have helped clarify the nature and distribution of the problematical Buccleuch Beds in South Australia, and further work on this unit is expected. Bore logs from the Ivanhoe, northeast Manara and Jerilderie 1:250 000 Sheet areas will be transcribed in the near future.

RECENTLY PUBLISHED AND UNPUBLISHED REPORTS ON THE  
GEOLOGY AND HYDROGEOLOGY OF THE MURRAY BASIN

Allison, G.B., and M.W. Hughes, 1982 - The use of natural tracers as indicators of soil water movement in a temperate semi-arid region, Journal of Hydrology, in press.

Lindsay, J.M., 1982 - Stratigraphy and foraminifera of SADME Oakvale - 1 corehole, northern Murray Basin, S.A., South Australian Department of Mines and Energy Rept. BK. 82/64.

## APPENDIX

### General Statement - Murray Basin Hydrogeological Project

This project is a long-term study which is being undertaken jointly by South Australian, Victorian and New South Wales geological surveys and water authorities and by the Commonwealth Bureau of Mineral Resources, Geology and Geophysics. It will be co-ordinated by a Steering Committee comprising members of those organisations.

The Murray Basin is a geological structure with an areal extent of some 300 000 km<sup>2</sup>. In each of the three States the basin sediments contain very large groundwater reserves. Where the groundwater has a low salinity it is increasingly being used for irrigation and town water supply purposes. In much of the basin, the groundwater is suitable only for stock use and is extensively used for this purpose. In other parts of the basin the groundwater is too saline for any use. There is a complex interaction between groundwater and surface water which may be beneficial, as in recharge areas in some parts of the basin, or harmful as in areas of saline groundwater discharge to rivers. In recent years, the States involved have stepped up the rate of assessment of the groundwater regime in the basin.

The primary aim of the Project is to improve the understanding of the groundwater regime of the basin by examining it as a single entity, unencumbered by State boundaries. Since a knowledge of the geology of an area is basic to the understanding of groundwater occurrence, a geological study of the basin is an essential part of the Project and as a consequence it will also be possible to make an assessment of other mineral resources.

The Project is planned initially to last five years and will be organised in five phases:

(ii)

- (1) Geological synthesis, using all available geological and geophysical data.
- (2) Hydrogeological assessment, on the basis of available data.
- (3) Documentation of deficiencies in geological and hydrogeological information and formulation of proposals for appropriate work programs.
- (4) Additional work as approved which could include stratigraphic drilling, aquifer testing, biostratigraphic analysis and isotope hydrology studies.
- (5) Development of numerical model(s), if found to be appropriate in the light of the data then available.

Investigation currently being undertaken by State authorities will continue, and data generated by them will be used for the joint Basin Project. Collection, collation and compilation of data during the first phase, and interpretation and documentation of the second and third phases, will be undertaken by officers of BMR with assistance from officers of the State authorities. Additional work required in Phase 4 (e.g. stratigraphic drilling, geophysical investigations) may be conducted by BMR or by appropriate State authorities. The development of a numerical model (Phase 5) if found to be feasible, may be undertaken by BMR. The Project will depend on the close co-operation of staff from all organisations involved, and some movement of staff between organisations for short periods will be necessary. Throughout the study, individuals and organisations will be encouraged to publish results of various aspects of the work. Results of the overall Project will be incorporated into joint publications.