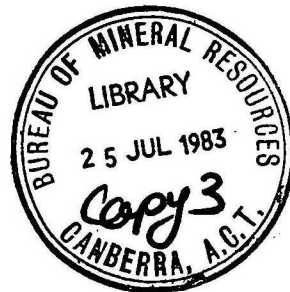


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BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD

RECORD 1983/23

MURRAY BASIN HYDROGEOLOGICAL PROJECT

PROGRESS REPORT 9

for half year ending 31 March 1983

compiled by

W.J. Perry

RECORD 1983/23

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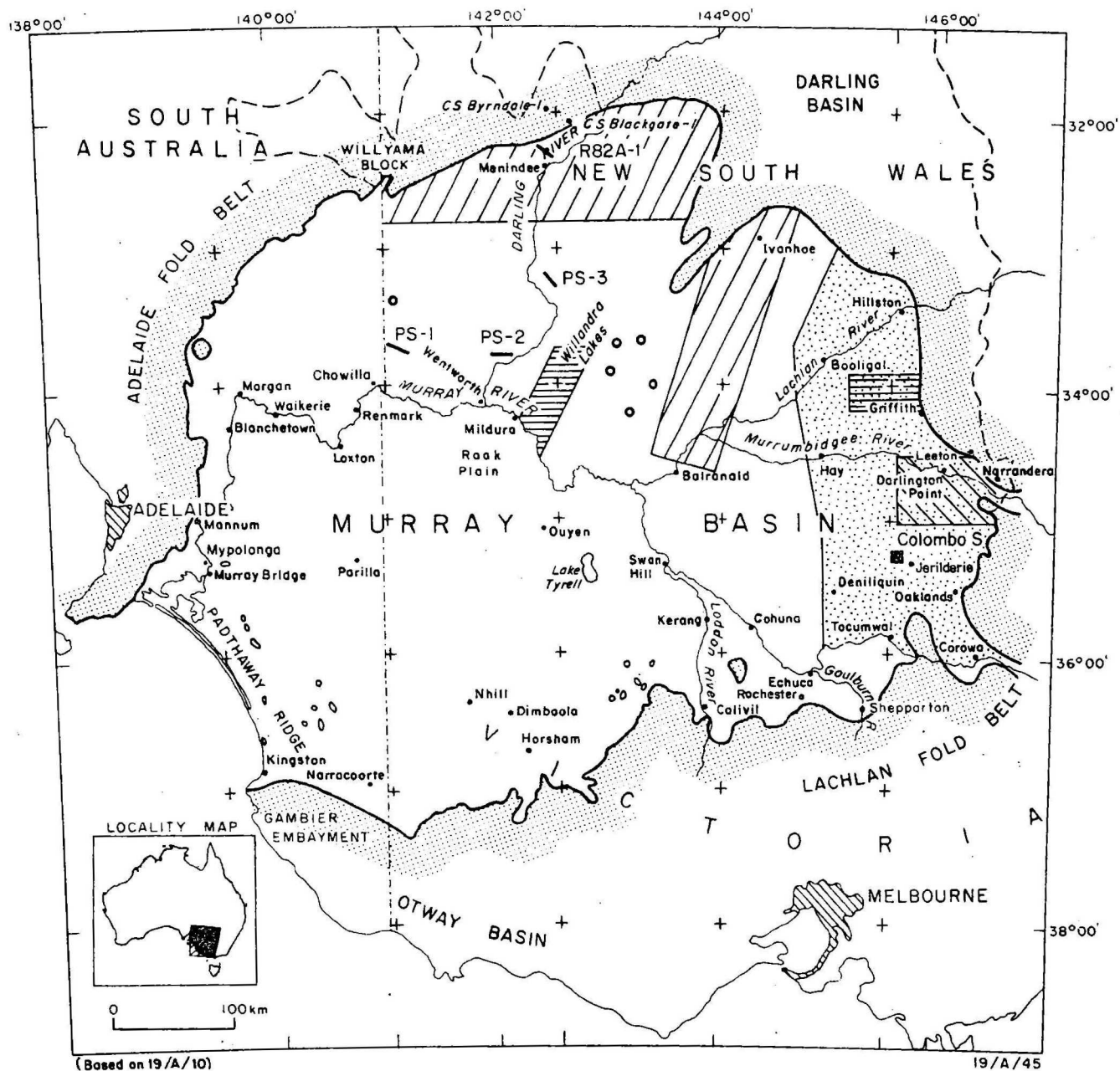
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NSW Department of Mineral Resources

R82A-1 *Esso experimental reflection seismic survey*

PS-1,2,3 *Esso proposed seismic surveys*

Colombo S *Meekatharra seismic survey*

Record 83/23

Water Resources Commission of NSW

○ Drought relief bore

▨ Water quality

▨ Seismic refraction

▨ Water levels

▨ Clay samples

Fig.1. Locality diagram

INTRODUCTION

During this period planning began for the second phase of the Project, a hydrogeological assessment of the Basin based on available data. The Steering Committee at its meeting on 2 December 1982 discussed ways in which the existing hydrogeological data might be presented, and later that month BMR hydrogeologist R. Evans visited the State Authorities to arrange ways of transferring hydrogeological data to BMR; work on the hydrogeological phase is scheduled to start in July 1983.

At BMR, C.M. Brown and A.E. Stephenson continued to compile 1:½ million scale geological maps, and prepared an outline of the bulletin on the geological synthesis; cartographer G Butterworth began the compilation and drafting of the 1:1 million geological map.

Members of the Steering Committee noted with regret the death on 9 January of one of their number, Mr Don Currey, Supervising Geologist of the State Rivers and Water Supply Commission. Mr Currey's contribution to the Project is recorded with appreciation.

PROGRESS REPORTS

WATER RESOURCES COMMISSION OF NEW SOUTH WALES

by

D.R. Woolley

1. Drilling

There was no exploratory drilling during the period. However strata samples from six draught relief stock bores ranging in depths from 160 to 230 metres have been collected from sites indicated on Figure 1.

The bores encountered both marine and non-marine sediments, and a total of 104 samples are being assembled for palynological examination and a lesser number for palaeontological examination.

The bores provide a good insight into the Pliocene, Murray Group and Upper Olney Formation marine transgressions in areas where data are sparse.

The Mallee Cliffs drilling outlined in the November 1982 report will commence at the beginning of June 1983.

2. Seismic Refraction Survey

35k of traverses were conducted in areas west and northwest of Griffith. Most of this work was directed at establishing the geometry at the basin margin.

One traverse of 15km was conducted and interpreted east of Mildura as part of the Mallee Cliffs project (outlined in the previous 6 monthly report). It delineated a basement ridge about 2-3km wide rising from depths greater than 400 metres to a minimum depth of 180 metres. A ridge of this proportion would occlude the Olney Formation known to exist at depth south, east and west from the ridge. Work on additional traverses in this area is continuing.

It has been proposed as the result of the drought relief drilling to establish up to 5 traverses on the bedrock ridge thought to run to the east of the Willandra Lakes.

3. Water Sampling

The water sampling program in the NSW part of the Basin is finished except between Balranald and Ivanhoe which is to be completed by the end of 1983.

The data for the area indicated on the attached plan have been sufficiently dense to enable the Parilla Sand aquifers to be regionally assessed. A report will be completed by September 1983.

4. Water Level Recording

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

5. Samples for Clay Analysis

Clay samples from 25 bores in the Coleambally Darlington Point Area are currently being assembled for dispatch to the BMR as discussed at the last Steering Committee meeting.

6. Reports

A paper entitled "The Hydrogeology and Hydrochemistry of the Renmark Group in the NSW Section of the Murray Basin" has been submitted to the International Groundwater and Man Conference to be held in Sydney during December 1983.

GEOLOGICAL SURVEY OF NEW SOUTH WALES

by

D.H. Probert

1. Coal Exploration

An assessment of the coal resource potential of the Menindee area has been prepared by C.J.Baker (GS1982/465). The report contains a summary of water bore lithological logs, uranium exploration boreholes, petroleum exploration wells and a number of seismic surveys. The available information suggests that small, irregular deposits of low quality coal of Tertiary age are present near Menindee. The economic significance of these deposits is uncertain but apparently rather poor.

2. Petroleum Exploration

1. Comserv (779) Pty Ltd have completed their aerial geochemical surveys over their Murray Basin and Darling Depression licence areas.
2. BHP intend to farm in to all the Darling Depression licences held by Comserv, pending Ministerial approval. BHP's commitment in the joint venture will involve conducting a 1000 km seismic reflection survey and the drilling of two wells to 1500 m depth.
3. a. ESSO have shot a 12 km experimental seismic reflection survey in PEL212, along the same line as the Comserv Blackgate Survey. (Figure 1) - R82A-1 Survey, shot November 1982.
b. ESSO intend to shoot 3 seismic lines (PS1, 2 & 3) in PEL's 213 and 214 (Figure 1). These

seismic surveys will be followed by three fully cored slim hole exploration wells (Stratigraphic wells), one hole located on each of the three seismic lines. The seismic surveys will be undertaken in May and the holes drilled in the second half of 1983.

4. Meekatharra has shot 40 km of seismic in PEL231, the Colombo survey, shot in March 1983 and sited near Jerilderie (Figure 1).

SOUTH AUSTRALIAN DEPARTMENT OF MINES AND ENERGY

by

M.Cobb

The rotary-drilling investigation has continued in the western margin of the basin with three new piezometers successfully completed within the confined aquifer. Multiple completion cable-tool wells have been installed at 5 sites within the riverine tract between Mypolonga and Chowilla to examine groundwater inter-reaction with the river.

Levelling of private wells and a data assessment programme is continuing within the Murray Mallee area.

As a result of an interdepartmental committee meeting, all Upper Murray Irrigation Area piezometer data have been collated and stored on a central computer base.

Hydrographs of water table aquifers adjacent to the River can now be constructed for periods of from ten to twenty-eight years throughout the Upper Area of South Australia.

GEOLOGICAL SURVEY OF VICTORIA

by

C.R.Lawrence

Three comprehensive reports are well advanced despite emergency work carried out for the past 8 months because of the drought.

One by P. G. Macumber on the hydrogeology of the Loddon River Valley and the northern Mallee is at the draft stage and is being edited at present. Emphasis of this report is on interpretation of the antecedent i.e. Quaternary hydrologic conditions of the Murray Basin by studying groundwater discharge zones, including the precipitation of Fe, Na, and Ca salts. In addition the contemporary records of a network of observation bores are interpreted. This indicates that groundwater flow in the vicinity of salt lakes is complex; they are underlain by reflux brines and bounded by salt-water interfaces.

This work is particularly relevant to elucidating changes in the hydrologic regime with European settlement and understanding the process of salinization in terms of groundwater behaviour and of the complications of using salt lakes as evaporation basins for excess drainage water.

A comprehensive hydrogeological/salinity report is being prepared by S. Tickell and W. Humphrys for the Victorian part of the Riverine Plain. All bore data have been examined and the hydrogeological map of 1:250 000 Bendigo Sheet is at an advanced stage for publication.

As a result of the drought the development of groundwater resources for irrigation was accelerated in the Campaspe, Goulburn and Murray River valleys. There were some regional groundwater depressions created near Cobram & Rochester which are causing concern.

Dr R. Williamson has completed a numerical and transient model analysis of the Campaspe River Valley which makes predictions of the future groundwater behaviour therein. The model has been developed in such a way that it could readily be used elsewhere within the Murray Basin. This report has been submitted for publication.

Of special interest is the Parliamentary Salinity Committee whose terms of reference concern the process of salinity and the techniques of its control. They recognize the interstate aspects and also seek relevant information in this area; they have embarked on 2-year program including public hearings, the use of consultants, and a Departmental liaison committee.

The joint SA - Victoria border zone groundwater management proposal was completed last year, but the amending reciprocal legislation has not been passed as yet.

BUREAU OF MINERAL RESOURCES

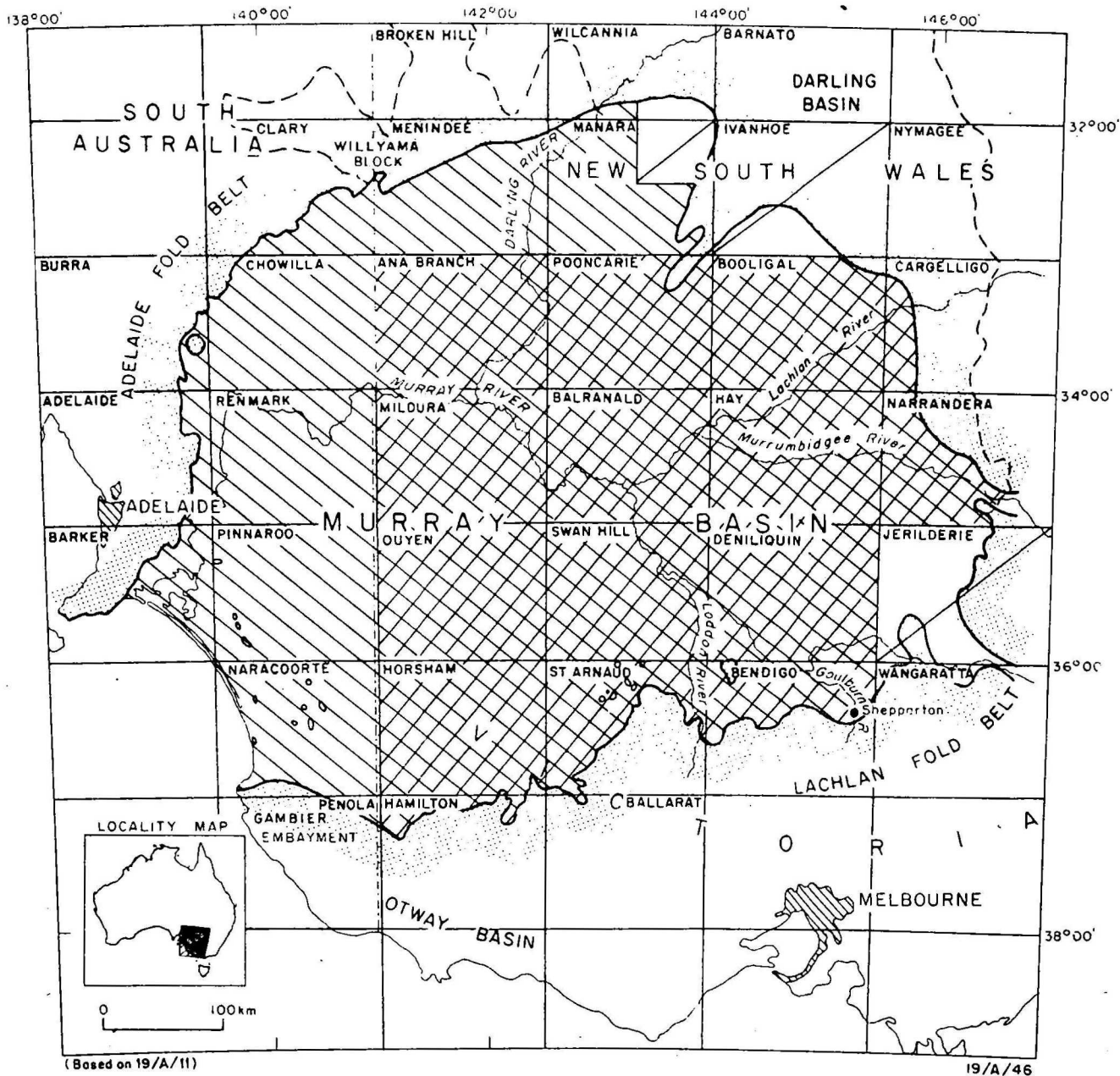
by

C.M. Brown

Work undertaken in BMR during the period under review has mainly been concerned with activities related to the compilation and drafting of the 1:1 000 000 geological map of the Murray Basin. Preliminary work commenced on writing of the BMR Bulletin, and tabulation of aquifer and stratigraphic data for inclusion in microfiche reports was largely completed. A discussion paper was prepared for submission to the Journal of the Geological Society of Australia.

C.M. Brown and A.E. Stephenson completed compilation of generalised pre-Cainozoic geology flanking the Murray Basin at 1:250 000 scale for photo-reduction to 1:1 000 000 scale (17 map sheets). The generalisation is designed to emphasise provenance and framework tectonic elements. Drafting of the basement geology at 1:1 million scale was completed during the period. Similar 1:250 000 scale compilations of Cainozoic geology were completed for 17 map sheet areas, and work is continuing on a further 14 map sheet areas. W.J. Perry completed photo-interpretation of the Balranald 1:250 000 map sheet area and Brown and Stephenson continued photo-interpretation of other previously unmapped sheet areas in the NSW sector of the basin. Perry also examined 1:1 million scale colour composite Landsat images and compiled lineaments on a previously prepared 1:1 million B/W Landsat mosaic.

Stephenson compiled the available palaeontological data from the basin, and in particular documented the marked ecological differences between the component formations of the Murray Group depositional sequence (late Oligocene-mid Miocene). Brown commenced work on compilation of stratigraphic tables for the Murray Basin Bulletin.



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

Documentation of the regional distribution, depositional environment and geometry of the major aquifer systems in the South Australian part of the basin was completed. Localities of all boreholes used in the Murray Basin study were digitised. Depth, thickness and relative levels of top and base of the three major aquifers beneath the following 1:250 000 map sheets were entered into a separate micro-computer aquifer database for sorting and retrieval: Cargelligo, Narrandera, Wangaratta, Booligal, Hay, Deniliquin, Bendigo, Swan Hill, St Arnaud, Mildura, Ouyen, Horsham, Hamilton, Olary, Chowilla, Burra, Adelaide, Barker, Renmark and Pinnaroo. Subsurface data from the Jerilderie map sheet area were received from the W.R.C., NSW in January but have not yet been tabulated.

W.J.Perry wrote an article on the Project for the 1982 BMR Yearbook, and Brown completed a discussion paper on "A Cainozoic history of Australia's southeast highlands" for submission to the Journal of the Geological Society of Australia.

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

Barnett, S.R., 1983 - Murray Basin Hydrogeological Investigation, Data Assessment, Mallee Region, S A Department of Mines and Energy, Report Bk.No. 83/18.

Drury, L.W., 1982 - Age, movement and recharge of groundwater in Tertiary sediments of the Lower Murrumbidgee River valley, Water Resources Commission of NSW Hydrogeological Report, No 1982-11.

Edwards, D.R., 1983 - Murray Basin Hydrogeological Investigation, Drilling Programme - Northwestern Margin, S A Department of Mines and Energy, Progress Report No. 5, Rept. Bk. No. 83/16.

Edwards, D.R., 1982 - Murray Basin Hydrogeological Investigations, Drilling Programme - Upper Murray and northern region, S A Department of Mines and Energy, Progress Report No. 3, Rept. Bk. 82/77.

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 km². 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:

- (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, bio-stratigraphic 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.