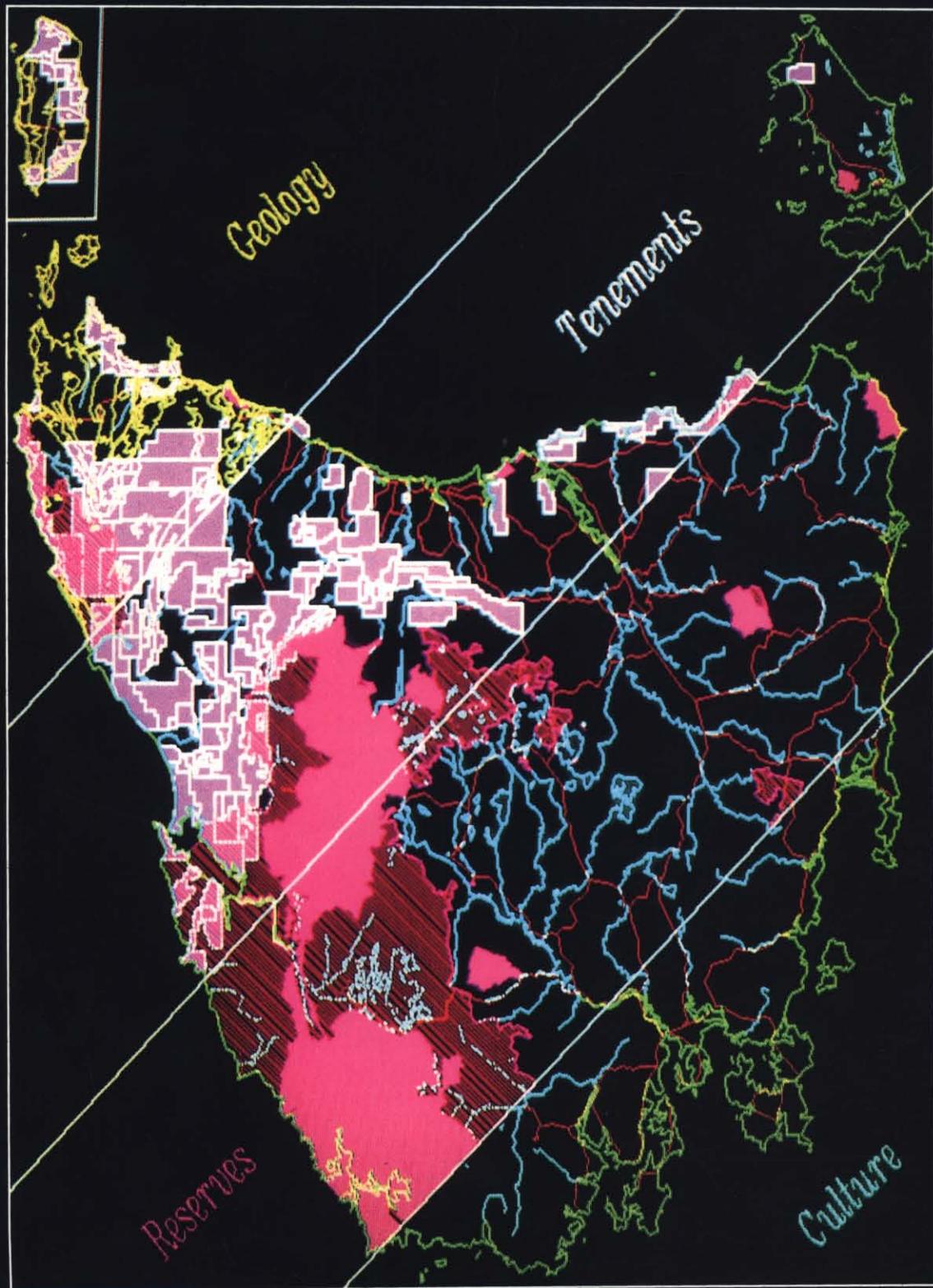


REPORT OF THE DIRECTOR OF MINES



1 9 8 8 - 1 9 8 9

TASMANIA DEPARTMENT OF RESOURCES & ENERGY
Division of Mines and Mineral Resources

Head Office

Gordons Hill Road,
ROSNY PARK 7018

P.O. Box 56,
ROSNY PARK 7018

Telephone (002) 30 8011
Fax (002) 44 2117

Burnie Office

Reece House,
Corner Mount & Cattley Streets,
BURNIE 7320

Telephone (004) 30 2202
Fax (004) 31 2960

Launceston Office

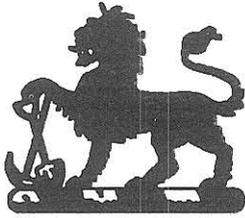
Chemical & Metallurgical Laboratory,
287 Wellington Street,
LAUNCESTON 7249

Telephone (003) 44 2431
Fax (003) 44 6565

Minister for Energy and Resources

The Hon. Michael Weldon,
Government Offices,
10 Murray Street,
HOBART 7000

Telephone (002) 30 8011
Fax (002) 23 8033



TASMANIA

1990

DIRECTOR OF MINES

**REPORT FOR THE YEAR ENDED
30 JUNE 1989**

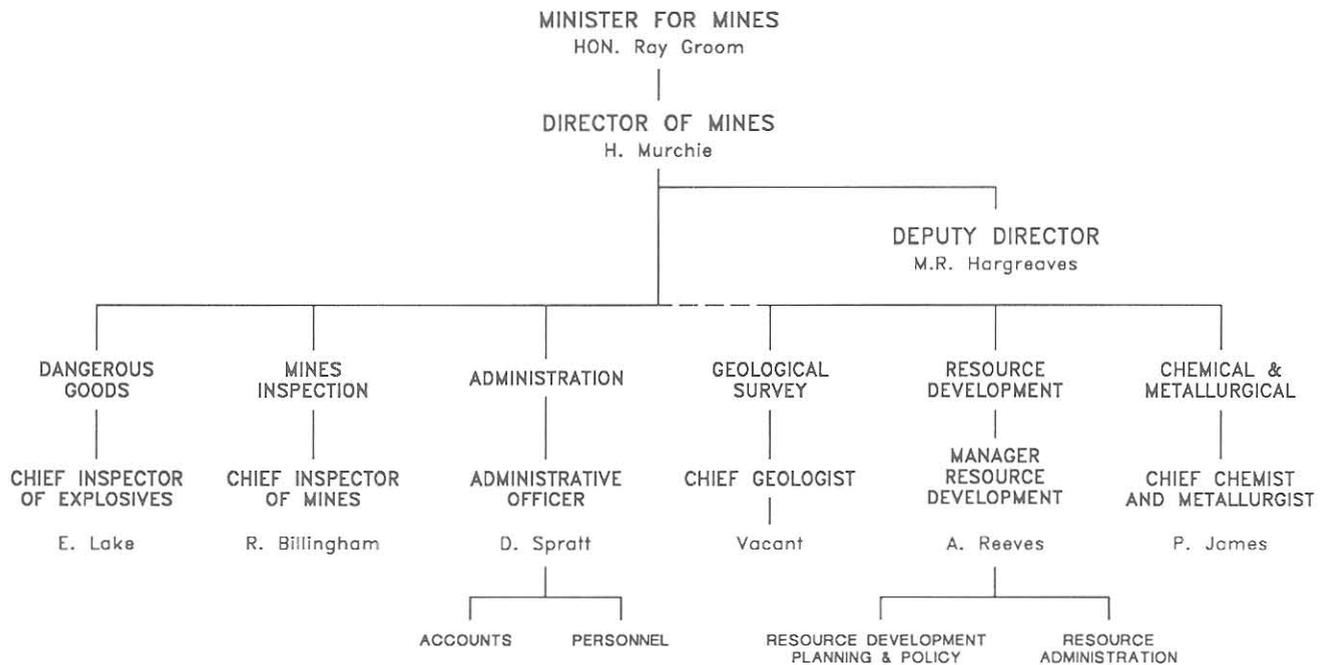
TABLE OF CONTENTS

	<i>Page</i>
REPORT OF THE DIRECTOR OF MINES	5
Overview	5
Review of the year	6
Review of Departmental activities	9
Value and production of principal minerals	11
Table 1—Value and production of principal minerals	11
Australian Minerals and Energy Council	11
Conclusion	12
 REPORTS BY DIVISIONS OF THE DEPARTMENT	 13
Resource Planning and Policy Development	13
Administration	15
Mines Inspection Division	17
Mines Inspection Branch	17
Drilling Section	20
Mining Industry—Major Operations	21
Mines	21
Works	26
Dangerous Goods Division	28
Geological Survey Division	32
Regional Geological Mapping Branch	32
Geological Atlas mapping program	33
Economic Geology Branch	34
Engineering Geology and Groundwater Branch	39
Petroleum Exploration and Marine Geology Section	40
Table 2—Oil Exploration Permits	41
Geophysics	41
Geological Support Services	43
Table 3—List of Unpublished Reports	46
Chemical and Metallurgical Division	47
 STATISTICAL TABLES	 52
Table 4—Employment and accidents	52
Table 5—Certificates of Competency	54
Table 6—Mineral production—Tasmanian sources	55
Table 7—Value of the mineral industry	56
Table 8—Mineral production since 1880	57
Table 9—Imported Ores	58
Table 10—Number and area of Leases and Licences applied for	59
Table 11—Leases and Licences issued	59
Table 12—Total number of Leases and Licences	59
Table 13—Total number of all types of rights	60
Table 14—Dangerous Goods Approvals issued	60
Table 15—Imports of Flammable Liquids	60
Table 16—Imports of Explosives	61
Table 17—Acts administered by the Department	61
Table 18—Staff as at 30 June 1989	61
Table 19—Drilling details, 1988–89	62
Table 20—Type and number of tests	63
 FINANCIAL STATEMENT	 65
 REPORT OF THE MT CAMERON WATER RACE BOARD	 68

DEPARTMENTAL FUNCTIONS

- the administration of the State's mineral lands and the regulation of exploration activities onshore and offshore.
- the regulation of mines and works, and the enforcement of safety and occupational health standards.
- the regulation of the transport, storage and use of dangerous goods.
- the systematic assessment of the geology of the State and the provision of a geological data base.
- the responsible development of the State's mineral and energy resources.
- the provision of chemical and metallurgical research facilities.

DEPARTMENT OF MINES ORGANISATION CHART 1988-89



REPORT OF THE DIRECTOR OF MINES 1988-89

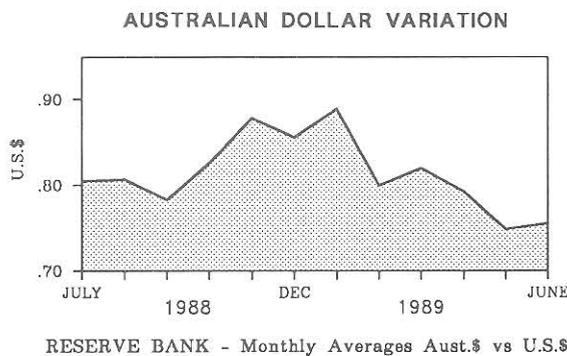
To the Hon. Michael W. Weldon, Minister for Resources and Energy.

Annual Report of the Department of Mines for the year 1988-89 submitted by the Acting Director of Mines, M. R. Hargreaves

OVERVIEW

The year 1988-89 has been a highly satisfactory one for the State's mining and metallurgical industries, with significant increases in the sales values of metallic and non-metallic minerals, construction materials, and metallurgical products derived from local and imported ores.

In general terms, international commodity prices rose steadily through the first two quarters, peaked in the third, and lost some of their gains in the final quarter. In Australian dollar terms, some of these gains were offset by the variation in the parity of our dollar with the US dollar, which peaked at 88.9 US cents in January 1989 (Reserve Bank—monthly averages).



However even with the constraints of the changes in the valuation of our dollar there has been a 21% increase in the value of sales of the industry products over last year's figure of \$1,159,998,691 to \$1,406,548,272 in 1988-89.

The price prognoses of the majority of commodities for which the State is prospective (i.e. copper, lead, zinc, silver and tin) are reasonably positive over the next one to two years.

This particularly healthy state of affairs is reinforced by the fact that more than \$950 million worth of new mining and processing developments are underway, planned, or proposed during the next five years. These developments include construction and ore development at Hellyer; refurbishment of the shaft, construction of an underground

crushing station, and development of access to ore at Mt Lyell; and development of ore access at Renison and Rosebery. However the major part of this investment will be involved in upgrading the metallurgical plants at Pasminco-EZ Risdon, Comalco, Temco and Tioxide.

Whilst this investment in expansion projects and new technology continues, it provides some confidence in the overall future for mining in Tasmania. However, unless new ore bodies are discovered and developed, existing mines, as depleting resources, will be unable to continue to operate, provide employment and create wealth.

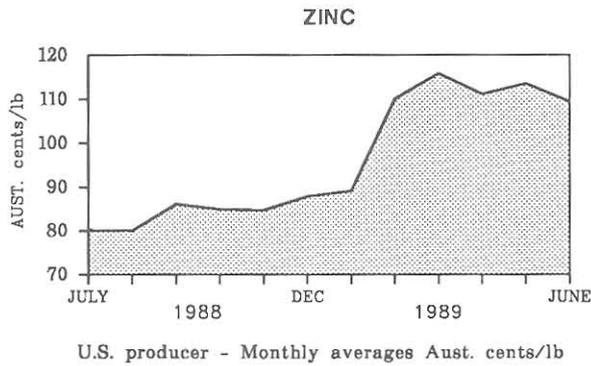
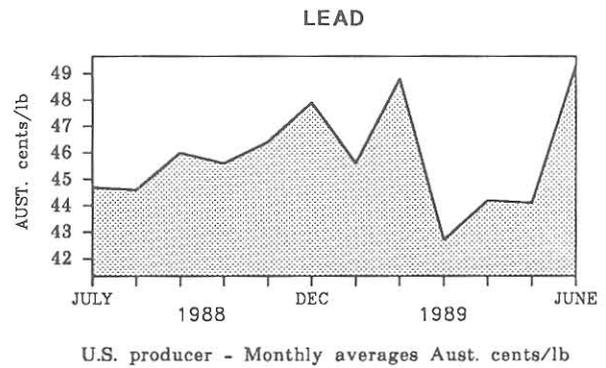
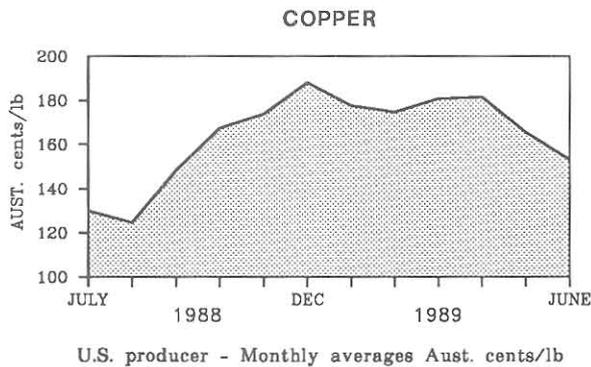
Obviously successful mineral exploration is the key to the future. New ore bodies must be discovered to replace the existing mines as they are exhausted, if the State wishes to maintain direct and indirect employment at current levels.

Successful exploration is dependent on three major premises:

- The occurrence of prospective ground
- Access to that ground
- The application of the most effective exploration techniques on that ground.

There is little doubt that Tasmania has an above average proportion of very prospective ground for volcanic massive-sulphide mineralisation, such as the Rosebery and Hellyer models, tin/tungsten mineralisation associated with Devonian granites, and a whole range of other commodities and construction materials.

With the clearly defined exception of the National Parks, access to ground for mineral exploration is available under clearly stated conditions in all other areas. There are sensible controls on exploration methods which have some environmental effect, such as track building, survey grid and drill pad construction, in place for all areas. All exploration programmes within the South West Conservation Area are approved, under Cabinet-approved guidelines, by an Inter-departmental Working Group, comprising officers from the Departments of Mines, National Parks, Environment and the Forestry Commission.



**VARIATION IN MAJOR METAL PRICES,
1988-89**

The traditional mining law concept of establishment of priority, by time of pegging for exploration tenements, has always given the governing authority little or no control on whether ground goes to the applicants likely to apply the most effective technology.

Tasmania is the first Australian State to address this problem, by having an effective tender system for the exploration of ground as it becomes available. Tenders are considered by a Departmental technical committee, and are judged on the proposed work programme after consideration of its technical merit, expenditure involved and the previous track record of the applicants. Minimum expenditures on such Exploration Licences are usually well in excess of the minimum requirements, defined in the regulations, and are incorporated in the individual Exploration Licence conditions.

In the same way, exploration programmes are required for all applications on open ground, and must be approved by the Chief Geologist.

Another measurement of the effectiveness of exploration techniques is the minimisation of lasting environmental effects. Due consideration of this aspect is given when considering the programmes, and adequate bonds, to cover any possible rehabilitation, are lodged with the Department.

Therefore, the Department believes that we have all the ingredients necessary to ensure the discovery of new ore bodies which will

guarantee the future of mining in the State. It is now up to industry to take up the challenge and make the investments in mineral exploration which will make this happen.

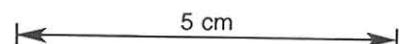
REVIEW OF THE YEAR

Six years after the first exploration drill holes were collared, Aberfoyle's Hellyer mill was officially opened on 10 April 1989. The period covering exploration, discovery, feasibility studies, Government agreement and construction has been extraordinarily short for a project of this size.

The capital investment of \$157M will provide 190 direct full time jobs and will entail the mining and processing of one million tonnes of ore per annum for some sixteen years.

An indication of the scale and importance of the mine is the fact that zinc produced from it will meet nearly 2.5% of current Western World demand.

The annual production of concentrate from the mine will comprise 170 000 tonnes of zinc concentrate; 45 000 tonnes of lead concentrate; 100 000 tonnes of bulk lead/zinc concentrate; and 10 000 tonnes of copper/silver concentrate, most of which will be exported. However, the zinc concentrate will be refined at the Pasminco-EZ plant at Risdon.



Most importantly, the mineralogy of Hellyer has provided further evidence to reinforce the similarity between the Mount Read Volcanic Belt and the Kuroko deposits of Japan, which suggests the strong possibility of the existence of further associated ore bodies.

During the year Spectrum Resources began the development of an underground tin mine at the former open-cut Anchor mine, 22 km north-west of St Helens. At year end construction of all surface facilities, including the mill and associated tailings dams, workshop and offices, was 90% complete and underground development had begun. The revitalised mine, which represents the most significant mining development in the north-east for several years, will produce 400 tonnes of high grade cassiterite from 100 000 tonnes of ore per annum.

During the year, the development of Renison Goldfields Henty Prospect continued to be encouraging. Following approval of the Environmental Management Plan by the Department of the Environment, development of the decline began in November 1988. The decline is being dug to access the ore body at 842 metres in order to acquire bulk samples for metallurgical testing and to develop further underground drilling access. At year end, the decline had been advanced some 555 metres, and 1230 metres of underground drilling had been completed. At the same time surface drilling has continued, with 5575 metres being completed. It should be stressed that all this multi-million dollar development is being completed, with no guarantee that the prospect will end up as an operating mine, and illustrates the risks which must be taken by explorers.

Savage River Mines continued to be a major concern during the year, with a two year wind-down phase commencing on 1 October 1988 when the Japanese consumers indicated that they would not be renewing the sales contract. However a feasibility study has been undertaken into the possibility of continuing production on a reduced scale beyond September 1990 to service the Australian market and spot sales. Mining plans have been prepared for production rates of both 0.9 and 1.3 million tonnes of pellets per annum in order to establish costs, and alternative markets are being actively sought. Such a course of action should prolong the life of the mine for approximately six years but will probably involve a restructuring of the joint venture and rationalisation of the work force.

Renison has had a productive year with a record production of tin in concentrate of 6940 tonnes due to an improvement of ore grade (showing the positive effect of tighter mining control), a significant rise in plant utilisation, and a record metal recovery. Unfortunately depressed tin metal prices during the year did not allow this productivity to be matched by profitability. However the prognosis of tin prices for 1989-90 suggests a healthier return next year.

The Mount Lyell mine continued development work to prepare the 50 and 60 series stopes for production to extend the mine life until 1994. At year end, the first of the stopes in the Prince Lyell 50 series was ready for slot opening. The 218 level crusher station and associated conveyor system and the overland conveyor, from the shaft to the mill, were almost complete. Improvements in the copper price returned Mt Lyell to profitability during the year.

The Electrolytic Zinc Company continued its \$150 million modernisation at Risdon during the year, with extensive construction projects across the site. The gypsum removal, solution purification and zinc dust plants were commissioned during the year. Following the installation of the new gold recovery plant at Rosebery last year, gold recovery was the highest achieved since 1985. Whilst underground production at Rosebery was slightly down on the planned target, an increase in head grade offset its effect. Meanwhile an intensive exploration programme continues on the Rosebery mine leases to locate additional ore sources to prolong the life of the mine, and potentially provide additional mill feed to offset the loss of material for treatment expected when the Que River mine closes in 1991.

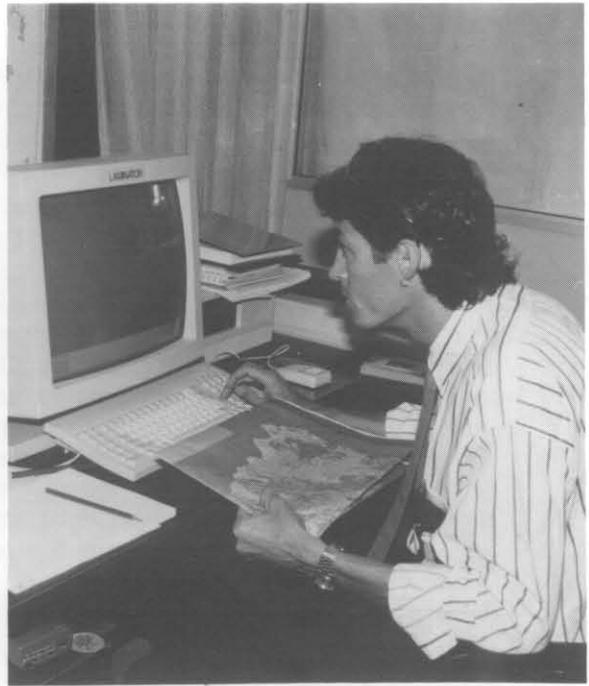
The construction of the \$70 million anode baking furnace continued at Comalco, with some \$44M being expended during the year.

By and large the year has been one of optimism, with operators increasing profitability and indicating that mood by capital investment. In some cases these investments will lead to reductions in employment but will also lead to increases of profit margins, which will, in turn, guarantee continuation of activity in the face of potential downward price fluctuations of international commodity prices.

This trend reinforces the vulnerability of mineral resource industries as price takers



Dangerous Goods Inspector David Wildmore inspecting old explosives found in a shed near Huonville.



Manager-Computer Services Peter James operating the newly-installed Geographic Information System.



Word Processor Operator Lisa Doran.



Isotope Analyst Michael Power operating the oxygen isotope line.

with little or no control of their product prices.

REVIEW OF DEPARTMENTAL ACTIVITIES

The year in review has been one of achievement for the Department. Through the year there have been numerous examples of innovation and improvements in productivity and service using the same staff resources.

Within the Resource, Planning and Policy Development Division significant progress has been made in reducing the backlog of mining lease applications, the programme of replacing and updating mineral charts has been reactivated, and a computer data base has been set up to facilitate the compilation of mineral statistics and monitor their collection. Since the Manager-Computer Services was appointed in February 1989 the EDP planning for the Agency is well ahead of schedule, with completion of preliminary data analysis, purchase of work stations for corporate and geographic data bases, and upgraded facilities in the Dangerous Goods Division, Administration, Geological Survey, Lease Drafting and the Launceston Laboratory. Finally, directions were developed for the determination of 'profits' for royalty assessment, and have been thoroughly and effectively applied with active and enthusiastic input from the Finance Manager.

Within the Administration Division staff movements and restrictions on the filling of vacancies have caused some problems but staff have been able to maintain a high level of service and support to the specialist areas of the Department. Word Processing and Records Management Sections deserve special mention. Increases in performance within the Department have led to a significant increase in reports and publications requiring typing; it is a credit to the Word Processing Section that this increase in productivity has been achieved with the equivalent of less than seven full-time positions within the Agency. In the same way, despite an increased responsibility for mining tenement files and increased correspondence, the Records Management Section has maintained its usual excellent service.

The Mines Inspection Division has continued to emphasise the promotion of safety within the workplace, through education and training, and the completion of regular occupational health surveys of major works

and concentrators, in addition to its routine inspection of work places. Increased occupational health monitoring, both by the Inspectorate and by industry, has resulted in an increase in the number of samples being tested at the Launceston Laboratory and by petrological staff in Hobart, who have achieved major increases in productivity to accommodate this need.

During the year there has been an increase in requirements for Dangerous Goods inspection and licensing, which has been accommodated with reduced staff because of resignations and a retirement.

All Branches of the Geological Survey have achieved increases in performance, examples of which are:

- Acceleration in the rate of production of Explanatory Notes, to remove the backlog and achieve a two-year turnaround time between map and note publication.
- Increases in activity associated with the Mount Read Volcanics Project in the form of Geological and Mineral Deposit maps and associated notes.
- A 40% increase in the value of consulting work for industry and property developers completed by the Department.
- Increased hydrological survey component, currently centred in the Sheffield area and the north-east of the State.
- Departmental input into the Geological Society's Bicentennial Volume *Geology and Mineral Resources of Tasmania*.
- Increased Departmental investigations into gold mineralisation in the State, specifically NETGOLD—a study of the north-east.

All these developments have placed an extra work load in support services, such as word processing, publications, cartography, lapidary, materials testing and the Launceston Laboratory.

Staff in all these sections deserve congratulations for their increased performance. Special mention should be made of the Cartographic Drafting Section, who have increased their productivity from 30 to 120 colour separations over the last three years with only a 25% increase in staff.

PRODUCTION OF PRINCIPAL MINERALS

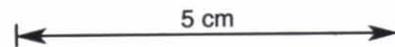
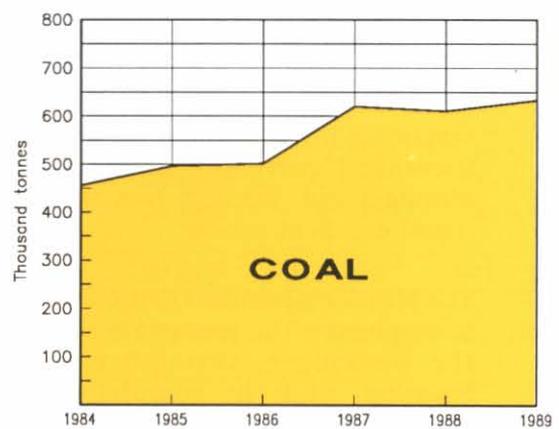
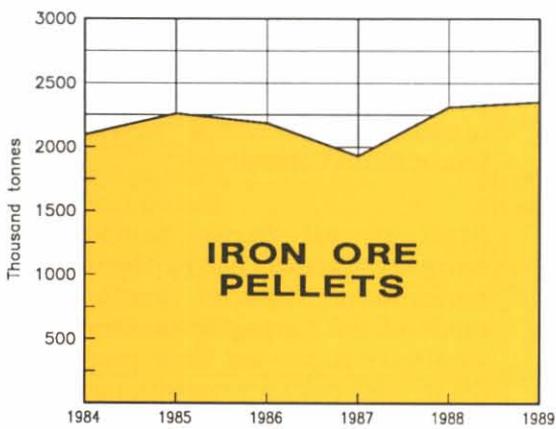
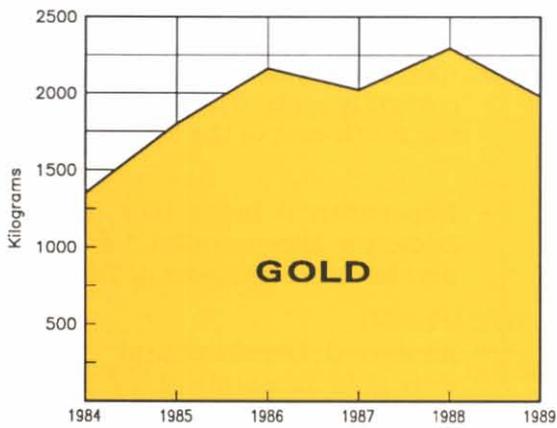
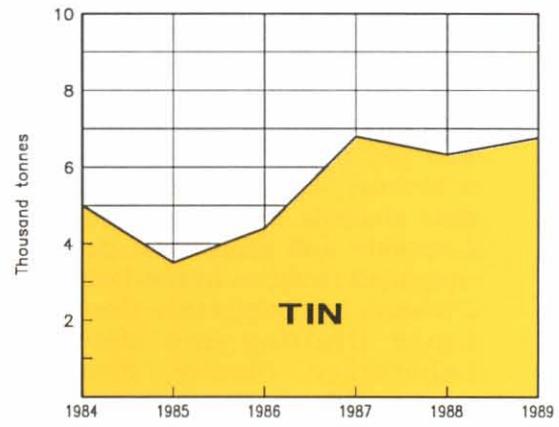
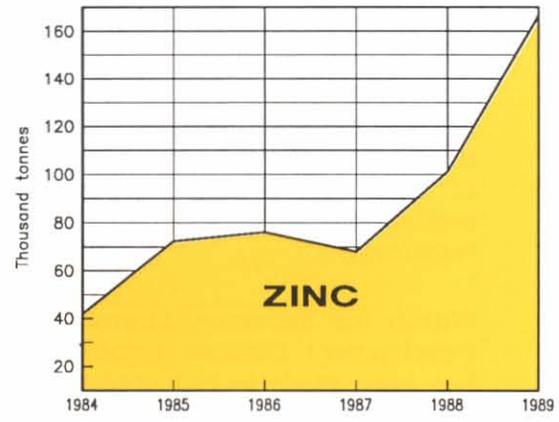
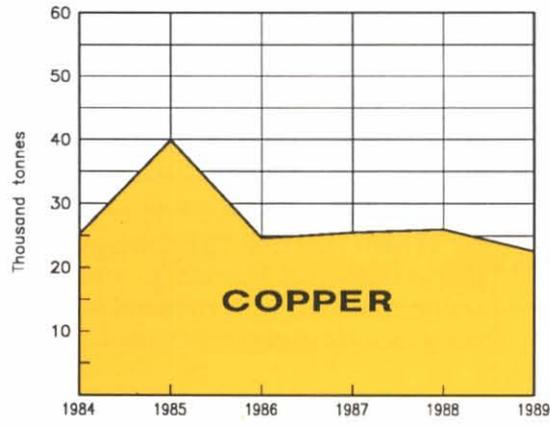


Table 1**VALUE AND PRODUCTION OF PRINCIPAL MINERALS**

<i>Commodity</i>	<i>Quantity</i>	<i>Value (\$M)</i>
Copper (tonnes)	22 286	65.45
Gold (kg)	1 972	27.72
Iron ore pellets (tonnes)	2 295 321	71.36
Lead (tonnes)	45 649	24.80
Silver (kg)	120 039	30.30
Tin (tonnes)	6 821	61.27
Tungsten as tungstic oxide (tonnes)	1 763	13.10
Zinc (tonnes)	166 602	210.42
Coal—Run of mine (tonnes)	632 375	-

Finally, the upgrade of facilities at the Chemical and Metallurgical Laboratory in Launceston is probably the best example of performance increases in the Department. During the last four years, the Laboratory's throughput has increased from 10 000 to 45 000 determinations per annum, with assay fees paid being increased by 70% in the last 12 months. Peter James, the Chief Chemist and Metallurgist, and his staff deserve congratulations for the dramatic improvement in service provided to the Department, industry and the public.

VALUE AND PRODUCTION OF PRINCIPAL MINERALS

The value of production from Tasmanian minerals was \$588 million, an increase of 16.4% over the previous year.

Production from imported ores at \$818M was an increase of 24.9%, while the total value of the Tasmanian mineral industry was \$1,406 million, an overall increase of 21.2% over last year.

AUSTRALIAN MINERALS AND ENERGY COUNCIL (AMEC)

The Australian Minerals and Energy Council (AMEC) was established on 9 April 1976 by agreement between State and Commonwealth Ministers for mines and energy, and replaced the former Australian Mineral Council.

AMEC is principally a forum for consultation on minerals and energy matters, where Ministers may discuss policy issues of mutual concern and co-ordinate policy action.

Previously chaired by the Commonwealth Minister with responsibilities for minerals

and energy matters, it is now chaired in rotation by relevant State Ministers.

This year the meeting was held on 11 November in Brisbane, with Tasmania represented by the Hon R. J. Groom, MHA, Minister for Mines and Minister for Energy, supported by Mr H. Murchie, Director of Mines and Mr W. Gaskell, Director of Planning and Public Affairs, Hydro-Electric Commission. Ministers considered a broad range of subjects and reports including:

- Commonwealth/State co-operation on mineral development
- Transport costs and competitiveness in the minerals sector
- Role of the public sector in minerals trade
- The role of the National Energy Consultative Council
- Establish a working party to correlate relevant information on the Greenhouse Effect
- Action plan from the Working Party on Gemstone Processing
- Uniform LPG legislation
- Original equipment LPG study
- Energy 2000 and oil self-sufficiency
- Education and environment
- Gold tax

At the close of the meeting Minister Groom invited AMEC to hold its next meeting in Hobart.

CONCLUSION

During the year, there were an unusually large number of retirements and resignations in the Department of staff who have provided long and valuable service.

They include:

- Roy C. Thomas (17.3.1989), who retired as the Chief Inspector of Dangerous Goods. Roy supervised the Dangerous Goods Inspectorate's transformation into a very effective unit by its assumption of a more pro-active and outlooking role, providing a much improved service, during a period when technology had involved a major increase in the use of Dangerous Goods and recognition of more of their dangers.
- Peter C. Stevenson (1.12.1988), who retired as Deputy Chief Geologist—Engineering and Groundwater Geology. During his tenure Peter was responsible for the development of an enlarged and much more important role for the Section. Just some of his achievements are the introduction of landslide hazard zoning, the Geodata Project, the Groundwater Control Act, and the Section's involvement in monitoring environmental hazards likely to affect groundwater such as waste disposal sites.
- Jeffrey Goodrick (9.9.1988), who retired as a Dangerous Goods Inspector based in Hobart. Jeff began his career with the Department as the magazine keeper for the Domain magazine. On taking up the wider

responsibilities of an Inspector, one of his favourite functions was that of 'Chief Fireworks Tester', and he was the main organiser of the Departments fireworks display held annually at the Clarendon Childrens Home at Kingston.

- William Hodgson (7.11.1988), who retired as the Mechanical Engineer, within the Mines Inspection Division, responsible for the inspection and licensing of machinery and operators on all mines and works. Bill was a quiet achiever who dealt with our clients with firmness and quiet humour.
- Stephen McManus (15.11.1988) resigned as the Deputy Registrar of Mines in order to complete a Law Degree at the University of Tasmania.
- Wendy Briggs (7.6.1989) resigned as the Personnel Officer in order to open her own business.

We wish them all well in their retirement or new endeavours, and commend them for their contribution to the Department.

Finally, I am grateful to the staff of the Department for their various contributions to our achievements of the past year. These achievements are not only the result of their dedication but of their innovation—they have always worked hard and are working progressively smarter.

M.R. Hargreaves

ACTING DIRECTOR OF MINES



Officers of the Environmental Management section were involved in the supervision of exploration in the Jane River area. The use of helicopters to lift in equipment limits damage to such environmentally sensitive areas.

REPORTS BY DIVISIONS OF THE DEPARTMENT OF MINES

RESOURCE, PLANNING & POLICY DEVELOPMENT DIVISION

The Division is responsible for administration of the Mining Act, for policy development in the Government's relations with the exploration and mining industry, and for co-ordination of approvals for new mineral resource developments.

Despite limited resources in certain key areas, the Division has made substantial achievements in areas critical to the State's mineral resource development and the implementation of Government policy.

REGISTRAR FOR MINES

The office of the Registrar has made substantial progress in reducing the backlog of mining lease applications, brought about largely by the unprecedented turnover of exploration licences during 1987-88 when many older exploration licences were terminated. The essential but time-consuming task of verifying records of mining tenements and transactions has been tackled, preparatory to the implementation of a relational data base and geographic information system which will ultimately provide rapid counter-access to records.

RESOURCE DRAFTING BRANCH

In spite of the high work load generated by the Exploration Licence turnover and by a record number of property search requests, the Branch has been able to resume its mineral chart program of updating and replacing reference maps. This work has been assisted by the improved availability of 1:25 000 map coverage from the Department of Lands, Parks and Wildlife. Preparations were made for the implementation of the Geographic Information System which will initially be installed in this Branch for a pilot program of mining and exploration tenement and related data, mineral deposit localities, geology, and land use classification.

MINERAL STATISTICS

For the first time for many years the collection and compilation of mineral statistics has been effectively carried out by an intense effort to have all lease holders respond within a reasonable time. A computer data base has been established,

and the integrity of the data assured through links with the records of the Registrar for Mines.

COMPUTING

The Manager-Computer Services was appointed to this newly created position in February 1989 to co-ordinate all departmental computing activities. In the few months of this year, a policy for purchase of personal computers has been developed, a preliminary data analysis of the Department has been completed, and software specifications have been prepared for word processing, geographic information system, and associated data bases, and training courses organised.

Two work stations were purchased for the creation of corporate and geographic data bases. Facilities were upgraded in the Dangerous Goods Division, Administration Division, Regional Geology Branch, and Lease Drafting. By the end of this financial year we expect to have a fully operational laboratory management system in the Launceston Laboratory, and to have completely wired the Rosny Park headquarters for high speed data interchange and for the sharing of resources.

ENVIRONMENTAL MANAGEMENT

The Environmental Management Section continued its valuable role in conditioning and supervision of all exploration activities in Conservation Areas and other environmentally-sensitive regions, including the design and monitoring of a low-impact sampling program at the Warnes Lookout mining lease (Jane River) in the World Heritage Area.

REVIEW OF THE MINING ACT

As a result of the Government's decision for a review of the Mining Act, a discussion paper *Exploration and Mining on Private Land—Issues for Public Discussion* was circulated. A consultant was also engaged to assist with the review, and to prepare a second paper for release dealing with other aspects of the Mining Act. The review will consider the role of the Mining Warden, the

appropriate number and type of mining tenements, registration of dealings, authority of the Director, Minister, and Governor-in-Council, and whether the multiple approvals of different authorities can be incorporated in a single development approval.

POLICY AND RESOURCE DEVELOPMENT

In association with the Economic Geology Branch, considerable effort has been expended on the implications for resource development of land classification proposals of other bodies.

A task force of Government officers was established to investigate the implications of the proposed closure of one of the State's large mining operations, and to advise Government on strategies to prolong the extension of the operation.

Directions were developed to ensure that the determination of 'profits' for royalty assessment of the major mines were consistent.

COURT OF MINES

Tasmania is divided into four mining districts, each with a Warden of Mines. The Wardens, who are magistrates, hear disputes arising under the Mining Act, 1929. The Wardens are:

Mr M. A. Hannon, Central Mining District and South-Western Mining District;

Mr P. T. Dixon, North Western and Western Mining District

Mr A. G. Schott, North and North Eastern Mining District

Cases referred to the Warden during the year consisted of:

S. C. Graham v Epoch Minerals Ltd. Application for forfeiture of leases 32M/81, 20M/74 and 64M/85. Lessee fined \$750 for non-compliance with labour covenant.

P. A. Moore v Epoch Minerals Ltd. Application for forfeiture of leases 75M/85 and 76M/85. Leases forfeited.

W. J. Gunn v Goldquest (Vic.) Pty Ltd and Mineral Holdings Aust. Pty Ltd. Application for forfeiture of leases 1236P/M, 1237P/M, 10M/86 and 11M/86. Hearing adjourned *sine die*.

Huon Municipality v S. and G. Armstrong. Application for forfeiture of leases 43M/38 and 68M/48. Hearing adjourned *sine die*.

Trustees of the Parish of Zeehan v G. E. Jackson. Application for forfeiture of lease 51M/84. Application dismissed.

D. C. Lane v G. E. Jackson. Application for forfeiture of lease 51M/84. Application dismissed.

M. O'Halloran and D. C. Lane v Electrolytic Zinc Co. of Australasia Ltd. Application for forfeiture of lease 123M/47. Application dismissed.

S. Graham v Epoch Minerals Ltd. Application for forfeiture of leases 32M/81, 20M/74 and 64M/85. Application dismissed.

G. E. Wickam v R. M. Frankcombe. Application for forfeiture of lease 1M/86. Application withdrawn.

Aberfoyle Resources v Oceania Tas. Pty Ltd. Application for forfeiture of lease 27M/89. Hearing adjourned *sine die*.

Trustees of the Parish of Zeehan v Electrolytic Zinc Co. of Australasia Ltd. Application for forfeiture of lease 123M/47. Application refused, successful appeal to Supreme Court. Application dismissed.

A. B. Lord and others v Evalast Minerals and Mining. Objections to Exploration Licence application 94/87. Objections withdrawn.

Raegun (No. 27) Pty Ltd v Conga Oil Pty Ltd. Objection to Exploration Licence application 1/88. Objection dismissed.

R. L. Arnold v Latex Pty Ltd. Objection to Exploration Licence application 1/89. Objection withdrawn.

ADMINISTRATION DIVISION

The Administration Division provides financial, accounting, personnel, word-processing and document management services to the Department. Staff movements and restrictions on filling of vacancies have caused some problems during the year but staff have responded to the challenge and have been able to maintain a high level of service and support to the specialist areas of the Department.

FINANCE AND ACCOUNTING

The Department again finished the year within Budget, and the provision of additional computing equipment has provided the opportunity and challenge to develop skills in this area. Staff attended computer familiarisation courses, and a number of spreadsheet applications have been developed and implemented to speed processing and provide better management information. This is particularly important in the financial management area, and better and more timely information is now being provided to the Executive on both expenditure and revenue.

PERSONNEL AND MANAGEMENT SERVICES

The section continued to provide personnel advice assistance and processing during the year despite some significant staff movements. Occupational health and safety is achieving a higher profile and committees have been set up in both Rosny Park and Launceston. Action is being implemented on a number of problems identified by these committees. A wide range of activities from

Ministerial support, building maintenance, and involvement with obtaining a site for the new core store at Mornington were undertaken by the section.

WORD PROCESSING

This section continues to provide a very high level of service to the Department. The introduction of word processing two years ago, albeit in a very small way, has led to a productivity gain of some 10% despite a reduction in staff from five to four.

RECORDS MANAGEMENT

The Records Section is in the throes of converting from cabinet storage to open shelving, and is installing a new system of file covers which will ultimately allow light-pen tracking of file movements. The section is also taking over management of mining tenement and dangerous goods files, which has placed a strain on the section's capacity. Staff have responded admirably and are to be congratulated on the standard of service they have maintained.

OFFSHORE PETROLEUM

During the year a significant amount of time was taken up in ensuring that participation in offshore petroleum permits was correctly recorded and registered. Problems arise when participating companies vary their holdings and overlook advising the Department. These oversights are often not picked up until later dealings are submitted and a full reconciliation becomes necessary.



Top: Word Processor Operators Jan Howie (left) and Kellie Campbell.

Middle (left): Receptionist Marilyn White

Middle (right): Clerk Lyn Bourn

Bottom: Cashier Nadine Cowen

MINES INSPECTION DIVISION

The Division has responsibility for monitoring working environments on mines and works to ensure the health and safety of workers; for the provision of an efficient drilling service for the Geological Survey and other Government agencies; and for assistance with the processing and monitoring of mining leases.

Promotion of safety in the industry remained the prime function of the Inspection Branch and with this in mind contact between the inspectorate and employees was encouraged. Atmospheric monitoring of working environments was carried out, and consequently some improvements were made to working conditions. Again there was a marginal improvement in overall accident statistics, but two fatal accidents were recorded; one on a mine and the other on an HEC construction site.

The Drilling Section had a successful year despite a lower metreage drilled and higher costs per metre.

STAFFING

At year end the Division was staffed by five mining engineers, a mechanical engineer and an electrical engineer, an industrial chemist, a drilling superintendent and eight drilling crew.

Staff shortages were experienced throughout the year because of resignations, early retirements, serious illnesses and long service leave. These shortages seriously affected the productivity of both the inspectorate and the drilling section. The inspectorate operated with an effective strength of only 60 per cent.

MINES INSPECTION BRANCH

GENERAL

The Inspection Branch is charged with administration of the Mines Inspection Act, 1968, and its attendant regulations. Assistance is supplied to other Divisions of the Department and other agencies in administering the following:

- Dangerous Goods Act
- Mining Act
- Petroleum (Submerged Lands) Act

- Environment Protection Act
- Industrial Safety, Health and Welfare Act

By regulation, and routine and special inspections, the Branch ensures that safe and healthy working practices are established and maintained in mines, quarries, works and the underground operations of the Hydro-Electric Commission. Plans and proposals for the operation of mines and mining equipment were examined and approvals issued as appropriate. During the year, some 540 field day inspections were carried out and 65 certificates of competency were issued (Table 5). Complaints from the public concerning illegal mining were investigated.

The Branch maintained good relationships with the Department of the Environment and the Commissioner for Town and Country Planning, and was involved in consultation for new planning schemes and for new developments.

REPRESENTATION ON OUTSIDE ORGANISATIONS

The Branch was represented on, and fully participated in, meetings of the following organisations:

- Tasmanian Dams Safety Committee
- Interdepartmental Occupational Health and Safety Committee
- Chamber of Mines Occupational Health Committee
- EZ Risdon Cadmium Committee
- SAA Committee ME/18 Mining Equipment
- SAA Committee EL/33 Mines Electrical Equipment
- SAA Committee MS/11 Hazard Zoning

HEALTH AND SAFETY TRAINING AND COMMITTEES

The Branch continued its involvement in training employees in industry by giving lectures on occupational health, chemicals and mine safety legislation in conjunction with the Tasmanian Trades and Labour Council, the Trade Union Training Authority,

and individual companies. Participants included employee safety representatives, committee members, and supervisors.

All major mines and works have well established safety committees with considerable employee representation. In some instances the committees consist almost entirely of employees, with management providing only clerical and technical assistance.

Although the Mines Inspection (Employee Safety Representatives) Regulations came into force in 1987, few employees have taken advantage of its provisions. Co-operation between management and employees has generally been of a sufficiently high level that election of safety representatives or official approval of committees has been largely unnecessary.

LEGISLATION

The Mines Inspection Amendment Act 1989 was proclaimed on 18 April. The major provisions of the amendment are:

- greater clarification of the responsibilities of managers and employees
- substantial increases in penalties and conversion to penalty units
- increased certification of crane drivers
- application of the Act to mines and quarries operated by Crown agencies
- removal of all restrictions for female employment on mines

Slow progress was made with the complete revision of the Mines Inspection Regulations because of delays in the office of the Parliamentary Counsel.

LEASE INSPECTION AND REHABILITATION

Lease applications are inspected in conjunction with the Department of the Environment to determine rehabilitation bonds. Routine inspections follow the development of progressive rehabilitation of quarries, gravel pits, sand pits and alluvial workings, and the increased co-operation from operators is pleasing.

As yet there has been no necessity to use a leaseholders bond for rehabilitation, but it is

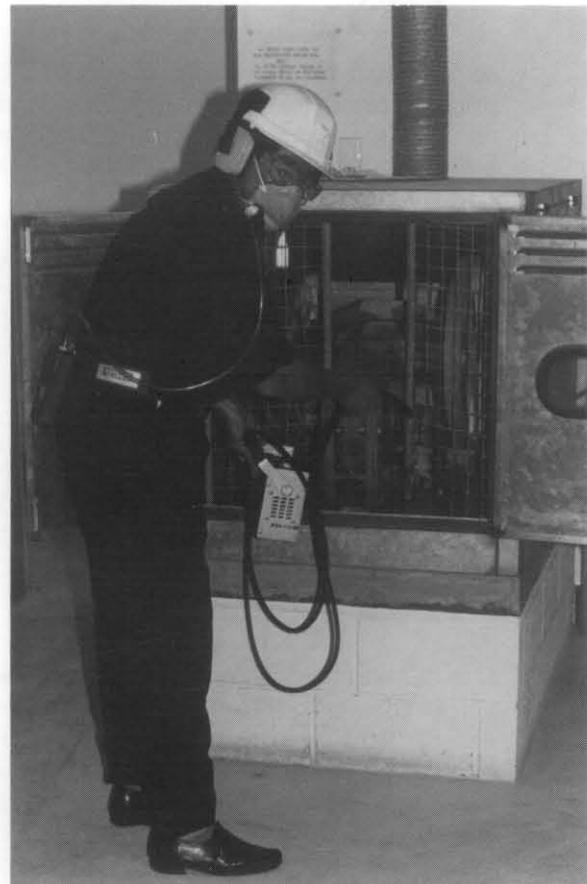
expected that this will occur in the next financial year.

Rehabilitation of worked out areas continued at Cleveland Tin, Tullah, Williamsford, Rosebery, King Island Scheelite, Cornwall Coal, Golconda and other mines sites, in addition to that undertaken on small construction material sites.

OCCUPATIONAL HEALTH SURVEYS

Occupational health surveys of major works and mine concentrators were continued during the year to assess real and potential dangers to employees. Progress was extremely slow due to the serious illness of both industrial chemists.

A large number of environmental atmospheric samples were taken for dust and gases by the industrial chemists. Dust analyses were carried out in the Department of Mines laboratories in Rosny Park and Launceston. Further increases were noted in the amount of environmental and biological monitoring carried out by the mining companies, and the results were available to the inspectorate.



Industrial Chemist Mike Curtain taking atmospheric gas samples in the workplace.

MECHANICAL AND ELECTRICAL INSPECTION

All major mines and works were inspected by the electrical and mechanical engineers to ensure compliance with the regulations and relevant standards. Considerable work on plant and equipment approval was required because of the significant levels of capital expenditure.

Major inspections were involved at Pasmenco-EZ Risdon because of plant modernisation; Aberfoyle's Hellyer mill; Mt Lyell's shaft and overland conveyor project; Comalco's carbon baking facility; and Beaconsfield Gold's mine winder installation.

Assistance was given to the Dangerous Goods Inspectorate with advice on PCB removal and handling, hazard zoning for electrical equipment, and insulation of equipment for petroleum wharf discharge.

Both electrical and mechanical engineers expressed concern about the quality and effectiveness of engineering supervision, and this was brought to the attention of mine management and the Chamber of Mines by the Chief Inspector. Changes in some management practices were instituted.

SAFETY AWARENESS

Two innovations to increase safety awareness on mines, works and quarries were the presentation of a special safety achievement award, and the introduction of a safety competition.

On 6 September the Minister for Mines presented a Government Achievement Award for Safety to the management and employees of Tioxide Australia Pty Ltd. Tioxide has consistently been the safest works operating under the provisions of the Mines Inspection Act, and the award was received by management on behalf of all employees at a well attended function in the Tioxide canteen.

In conjunction with the Chamber of Mines, the Department of Mines introduced a safety competition amongst mines and works. Four awards are to be made annually in the following categories:

- Major achievement in safety for the year, improvement over previous years, for attention to safety generally and for special efforts during the year.
- Safest small surface operation with 10–25 employees.

- Safest large surface operator
- Safest underground mine

The winners of the awards for 1988–89 in the respective categories were:-

Comalco; Boral Quarry, Bridgewater; Savage River Mines, Port Latta; and King Island Scheelite.

All employees of the winning operations are congratulated on their efforts during the year.

ACCIDENT STATISTICS

The 1988–89 accident statistics are listed in Table 4.

Lost-time accidents and days lost decreased marginally over the previous year, but this improvement is no cause for satisfaction.

The incidence rate shows that the equivalent of one in five employees is injured each year, and each accident causes an absence from work of 13 days. This situation is unacceptable.

It is sincerely hoped that the efforts currently being made by management, employees and the inspectorate to improve safety will have an early effect on the statistics—the only way of measuring success.

Accidents of one to three days lost accounted for 35% of total accidents; those of four to ten days a further 37%; and those over ten days 28%.

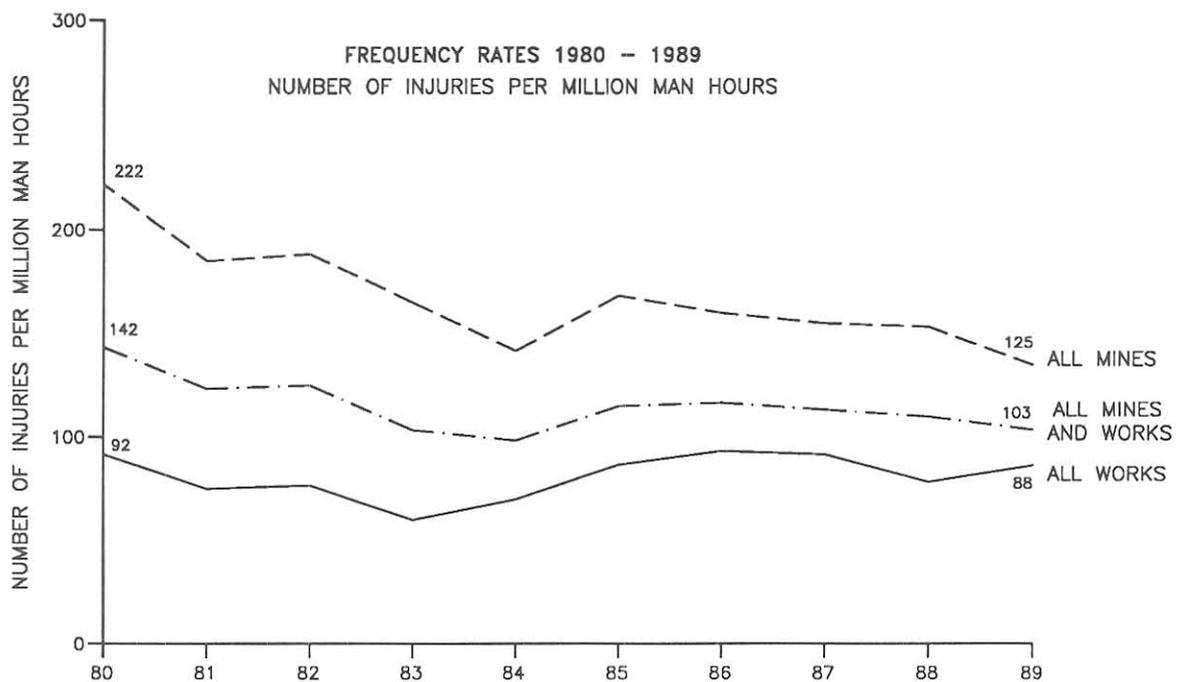
The number of accidents sustained by persons working underground was 366, or 27% of the total. Underground employees constitute about 10% of the workforce.

One fatal accident was recorded on operations covered by the Mines Inspection Act, which was a considerable improvement over 1987–88.

A further fatal accident occurred at the Hydro-Electric Commission's operations at Crotty, where inspections were carried out on behalf of the Department of Labour and Industry.

Fatal Accidents

- W. V. Banham of Savage River Mines at Savage River received fatal head injuries when his truck reversed over the edge of



the seven metre high face of a surface stockpile.

- W. G. Bryant of the HEC at Crotty was fatally crushed when the locomotive he was driving fell over the edge of a tip.

Non-fatal Accidents

The following is a brief description of the more serious non-fatal accidents which occurred:

Falling objects—in two separate incidents miners received fractures to the legs from falling ground; a miner received a fractured skull from falling ground; an operator suffered severe neck injuries when struck by a 200 litre drum; a driver received a fractured leg when struck by a load falling from a crane; two operators suffered fractures to the feet when anode rods fell on them in separate incidents.

Falls—two fitters received fractured limbs when they slipped and fell in separate incidents.

Machinery—a foreman suffered lacerations when struck by flying fragments when a compressor coupling exploded; a miner received contusions and crushings when a drill steel broke; an operator received a crushed foot when caught between a railcar and a loco; a timberman suffered fractured ribs when a sidetipper knocked him on to a grizzly and then fell on him; an operator received severe hand injuries when caught in a hoist rope coil; a quarry foreman caught his hand in a conveyor head drum.

Electrical—an apprentice suffered burns when removing a live faulty contact isolator switch; an electrician received wrist injuries when the door of a compressor motor starter was blown off.

DRILLING SECTION

Drilling output fell considerably during the year through loss of staff, resulting in only three crews operating in 1989. Nevertheless satisfactory productivity was maintained with several programmes undertaken.

Groundwater drilling was undertaken in the Scottsdale area following numerous requests from farmers affected by low rainfall. Borehole depths were taken deeper than needed solely for water production to provide information for regional assessment. The Sheffield survey was recommenced and completed by the end of the financial year.

A varied site investigation programme was required by the Department of Main Roads for road cuttings, road and bridge foundations, and harbour works at Eaglehawk Neck, Penguin to Howth, Currie, Burnie, Stanley, Hadspen and Glen Esk. Other minor contracts were also completed.

The Meander River Damsite required a significant effort in difficult conditions, and geological reassessment required additional drilling. This delayed the start of stratigraphic drilling at Liberty Point on the western shore of Macquarie Harbour. Drilling was curtailed here when winter weather conditions set in.



Drilling for groundwater at Wilmot as part of the Sheffield groundwater study.

Two holes were drilled as part of Mt Read investigations; one was near the Cradle Mountain Link Road and the other was the final sub-basalt investigation hole at Yellow Marsh. A platinum-chromite investigation hole was completed near Melba Flats. Contract drilling for minerals was done at Kelso and Mt Direction.

Drilling programmes for the year are summarised as follows:

	<i>metres</i>
Groundwater drilling	2128
Site investigation	1411
Meander River	905
Stratigraphic investigation ..	1084
Mineral contract	570
Total	6098

A full drilling summary is given in Table 19.

MINING INDUSTRY—MAJOR OPERATIONS

MINES

Aberfoyle Resources Limited (Hellyer Division)

The one million tonne per annum on-site mill was handed over by the construction contractors to the mine operators in late

February 1989, and was commissioned during March. An official opening by the Premier of Tasmania took place on 10 April.

A total of 423 096 tonnes of ore, at a headgrade of 14.3% Zn, was mined during the year. As the year progressed, output was gradually increased towards the planned one million tonnes per annum.

Until 22 December 1988 concentrating operations continued at the Luina mill. Bulk concentrate production by this means amounted to 6914 tonnes at 32.9% Zn, 17.6% Pb and 376 g/t Ag.

Concentrate production at the Hellyer concentrator to 30 June 1989 was as follows:

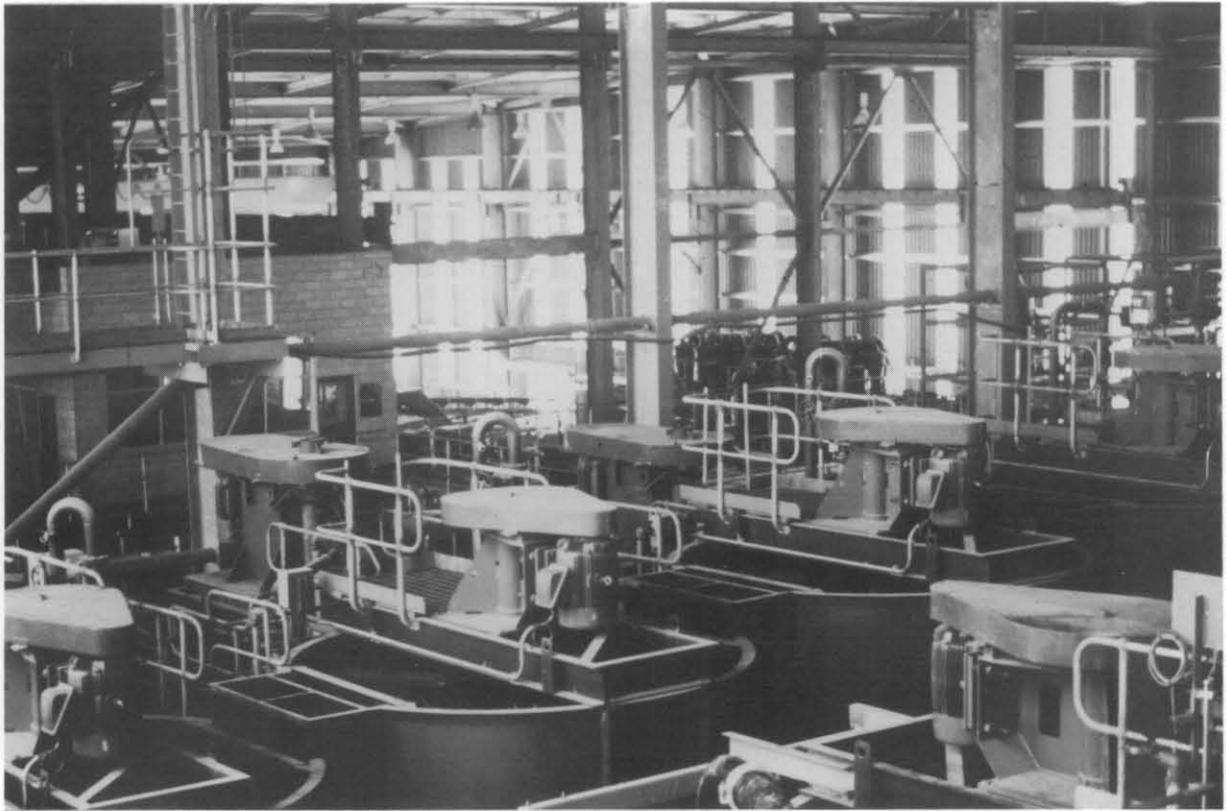
Zinc concentrate: 29 626 tonnes at 48.9% Zn, 4.4% Pb.

Bulk concentrate: 25 304 tonnes at 25.6% Zn, 25% Pb, 2.78 g/t Au, 338 g/t Ag.

Lead concentrate: 6612 tonnes at 57.4% Pb, 6.3% Zn, 3.61 g/t Au, 765 g/t Ag.

Copper/silver concentrate: 4340 tonnes at 4491 g/t Ag, 2.9 g/t Au, 19.2% Cu.

At year-end the total workforce consisted of 177 persons.



Flotation cells inside Aberfoyle's new Hellyer mill (above), which was opened during the year.



A permanent winder and headframe was installed at the old Tasmania Gold Mine at Beaconsfield (left) during the year.

A large number of trees have been planted around the Cornwall Coal Company's washery at Fingal (below) for screening purposes.



Industrial disputes disrupted mining operations for thirteen days and concentrating operations for one day.

Aberfoyle Resources Limited (Que River Division)

A total of 276 400 tonnes of ore was hoisted to surface during the year under review. Road haulage of ore to the Pasminco mill in Rosebery amounted to 254 400 tonnes containing 12.28% Zn, 6.9% Pb, 197 g/t Ag and 3.1 g/t Au.

The increase in ore reserves as a result of exploratory drilling was minimal, and ore reserves were effectively reduced by the tonnage of ore extracted by mining. Proved and probable ore reserves declared as at 15 November 1988 were 810 000 tonnes at 10.6% Zn, 5.4% Pb, 158 g/t Ag and 2.5 g/t Au.

The total workforce at year-end was 98 persons, of whom 34 were contractors' employees.

Two production days were lost due to industrial disputes.

Beaconsfield Operations Pty Ltd, Beaconsfield

Shaft recovery and installation of steel supports in the Hart Shaft of the old Tasmania Gold Mine continued during the year until the blockage was cleared. The water level was lowered to 105 m below surface and the original sets at 103 metres were exposed. A permanent winder and head frame were installed.

Operations were scaled down at the end of the year and a proposal to purchase new high capacity de-watering pumps was deferred. Maximum installed pumping capacity was 14 cusecs, which should lower the water level by about 1.2 metres per week.

Total expenditure on shaft rehabilitation, hydrological research, and exploration was some \$5.3 million.

Cornwall Coal Company NL, Fingal

Run-of-mine production for the year totalled 589 943 tonnes. Washed-coal output amounted to 356 282 tonnes and total sales were 360 452 tonnes. No time was lost through industrial disputation.

At the Duncan Colliery, coal production amounted to 220 330 tonnes. The campaign

of pillar extraction in the northern part of the mine was concluded in January. Development work in the southern area continued and the main headings were turned west to aim at a borehole intersection of good coal. Following the termination of work in the northern area, this development proceeded on three shifts per day, and had reached a position 5700 metres from the portal at year end. Expenditure on capital items for the mine amounted to \$566 000. These items included a replacement breaker-feeder, a personnel transporter, a road grader and services extensions.

Blackwood Colliery produced 321 399 tonnes of coal from underground and 90 371 tonnes of open-cut coal. Due to the occurrence of severe ground movement, a 200-metre pillar of coal was left in the underground mine. On the southern side of this pillar, retreat mining was continued and had reached 1500 metres from the portal at year end. As well as producing coal, open-cut work established a pit top for the proposed Blackwood No. 2 mine. Two portals were formed in the Blue Upper Seam and electric power was installed to the site. Overburden dumps were recontoured and natural regrowth on this material is already occurring.

A large part of the washery reject dump was also recontoured and was planted with 2000 young trees, together with a large quantity of tree seeds. Approximately 1000 more trees were planted around the washery site for screening purposes.

Computerised control of the washery's electrical system was installed at a cost of \$179 000, and a further \$209 000 was spent on surface-vehicle replacement.

King Island Scheelite

Ore produced from underground sources during the year was 142 121 tonnes, an increase of 58% over that for 1987-88. Ore grade, at 1.21% WO₃ was slightly lower than the 1.26% of the previous year.

A total of 151 000 tonnes of ore at a headgrade of 1.136% WO₃ was treated through the concentrator. This tonnage exceeded the budget by 6070 tonnes.

Scheelite gravity concentrate production amounted to 1217.5 tonnes containing 74.3% WO₃. Low Molybdenum Scheelite concentrate recovery totalled 593.9 tonnes at 79.3% WO₃. Total concentrates produced fell short of the forecast by 28.6 tonnes.

Marketing of concentrates, particularly the gravity concentrate, again proved very difficult.

The labour establishment at year-end was 98 employees, an increase of two over the previous year, and nine contractors.

No shifts were lost through industrial action.

The Mount Lyell Mining and Railway Co Ltd, Queenstown

Mine development continued and the first of the stopes in the new Prince Lyell 50 Series was ready for slot opening at year end.

Over the year, 3784 metres of driving and 711 metres of rising were accomplished. Most of the 53, 54 and 55 stopes area was developed on 115 Sub and 200 Sub levels. Accesses from 17 Level to 220 Sub and the 50 Series Decline to 170 Sub were commenced. The 50 Series Decline from 115 Sub to 220 Sub (or 17 Level) broke through on 8 June 1989. In addition, development of 40 Series 'A' Lens was restarted and completed, and six raise-bored rises were developed, including a pilot extension of the Southern Exhaust Airway between 90 Sub and 17 Level.

At year end, 18 Level crusher station and the associated conveyor system were almost ready for commissioning, and the installation of the Overland Conveyor, between the Prince Lyell shaft and the mill, was nearly complete. The upgrading and refurbishment of the Prince Lyell shaft for full-scale ore hoisting was well advanced.

Mine production totalled 1.64 million tonnes of ore. Development in the Prince Lyell 50 Series and Royal Tharsis stoping produced 9.8% and 6.2% respectively of this total, and a small tonnage was derived from 'A' Lens. The balance came from the Prince Lyell 40 Series of stopes.

The ore treated amounted to 1.63 million tonnes at a grade of 1.24% Cu. Production from this was 68 324 dry tonnes of copper concentrate and 84 125 dry tonnes of pyrite concentrate. The copper concentrate contained 18 678 tonnes of copper, 2 887 659 grams of silver, and 434 659 grams of gold.

Capital expenditure for the year was \$6.31 million.

Pasminco Mining—Rosebery

Underground ore production totalled 516 863 tonnes which reflected a shortfall of 7% against that planned for the year. The zinc headgrade, at 10.52%, was approximately 8% higher than that forecast.

Production performance was affected by poor production loader availability, the lack of capacity in the shaft system to handle +300 mm material, and industrial action resulting in the loss of six days production.

The problem concerning loader availability was being alleviated by the replacement of old electric and diesel loaders by new diesel units.

The problem with poor fragmentation has arisen as the tonnage of ore extracted from the diesel-powered mechanised decline section has increased. To overcome this problem a 1.15 m rock sizer is to be installed underground.

A total of 766 746 tonnes of ore was milled. Sources of ore were as follows:

	<i>tonnes</i>
Rosebery:	506 236
Que River:	254 389
Sylvester and Comstock:	6 121

Concentrate production was as follows:-

Zinc concentrate: 136 803 tonnes 53.9% Zn

Lead concentrate: 24 856 tonnes 60.6% Pb, 12.5% Zn, 684 g/t Ag

Copper concentrate: 30 989 tonnes 32.2% Pb, 9.8% Zn, 9.8% Cu, 1790 g/t Ag, 39 g/t Au.

Gold recovery, at 63.1%, was the highest achieved since 1983.

At year-end, an investigation into the efficacy of upgrading the copper concentrate relative to copper content was in progress.

Plans were in hand to replace the zinc rougher and scavenger cells by 12 eight cubic metre cells.

The final seminar of the Rosebery Exploration Team was held on 13 September 1988. Several coincidental drilling targets, based on results of the various studies undertaken by the team, were suggested.

A total of 488 persons were employed at year-end, a decrease from the 547 at the end of the previous year.

Renison Limited, Renison Bell

Production was again at a high level. During the year, 830 083 tonnes of ore were hauled from the mine and 822 854 tonnes were treated by the concentrator. The output of tin in concentrate as a result of this treatment was a new record at 6940 tonnes.

The principal factors giving rise to this record tin production were improvement in ore grade due to tighter mining control, a significant rise in plant utilisation, and a record metal recovery.

Industrial time loss, at 3.3% of possible milling hours, was the lowest experienced for many years.

Two mill evacuations due to hydrogen sulphide emission occurred, one in March and the other in May. A spate of carbon disulphide emissions caused five evacuations in February and March. Both hydrogen sulphide emissions were minor. The cause of the carbon disulphide emissions was found to be the xanthate in use at the time, being of extremely poor quality. Daily quality-control measures were instituted and these eliminated the problem. Nobody was adversely affected by either series of emissions.

Capital expenditure for the year amounted to \$4.57 million.

RGC (Tasmania) Ltd—Henty Project

A decline to gain access to the auriferous mineralised zone covered by the leases began on 25 November 1988. By year-end the decline had been advanced 555 metres of the total 842 metres required to intersect the mineralised zone. In addition, 81 metres of crosscutting for diamond drill cuddies, loading bays, sumps/pump bays and an electrical substation, were achieved.

Exploration drilling amounted to 5575 metres from the surface and 1230 metres underground. A gold resource estimate will be carried out after mining in the mineralised zone is completed.

Mining and diamond drilling operations were carried out by contractors who had 26 of their employees on site. Six RGC employees were involved in the project.

Savage River Mines

A two-year wind-down commenced on 1 October 1988.

Concentrate and pellet production continued at approximately the same rate as in previous years. However waste development in both open-cuts was progressively reduced.

Crude iron-ore production was down 7% on the previous year, and all material movement was 24% lower than the record set the previous year. Due to a higher weight recovery, concentrate production, at slightly over 2.3 million tonnes, was marginally higher than the production achieved during 1987-88.

In line with the reduction in waste development, the workforce at the mine was reduced by 22% through retrenchments and natural attrition. The number of employees at the Port Latta pelletising plant was reduced by 6%.

A feasibility study has been undertaken into the possibility of continuing production on a reduced scale beyond September 1990. Mining plans were prepared for production rates of both 0.9 and 1.3 million tonnes of saleable product by the extraction of ore from the South Lens and deeper in the Northern Deposit.

During the year a percussion drilling programme of the South Lens to confirm ore reserves was undertaken.

Spectrum Resources, Lottah

Spectrum Resources began the development of an underground tin mine at the former open-cut Anchor mine, 22 km north-west of St Helens. At year end construction of all surface facilities, including the mill and associated tailings dam, workshop and offices, was 90% complete, and underground development had started. When fully operational the mine is expected to have an annual production of 400 tonnes of high grade cassiterite from 100 000 tonnes of ore.

Tasmania Mines

The total tonnage of ore mined was declared at 129 260 tonnes at a grade of 0.77% WO₃. This compares with a mine output of 88 112 tonnes of ore at a grade of 1.16% WO₃ for 1987-88.

Ore treated through the mill during the year was 115 524 tonnes with an average

headgrade of 0.59% WO₃. During the previous year 113 375 tonnes of ore at a headgrade of 0.75% WO₃ were treated.

Increasing problems with the capacity for tailings disposal were experienced.

Production output was 478 tonnes of high grade scheelite concentrate (72.7% WO₃) and 37 tonnes of low grade concentrate (50.6% WO₃). Sales of concentrate amounted to 499 tonnes.

The highlight of the year was a substantial increase in the sales of magnetite concentrate (117 220 tonnes compared to 31 024 tonnes for 1987-88).

WORKS

Comalco, Bell Bay

Production was 123 000 tonnes of primary aluminium in the form of blocks, ingots, billets and granules from 238 000 tonnes of alumina. Main areas of activity at the works are manufacturing of carbon products, smelting of alumina, metal alloying and casting.

Raw materials used include alumina from Gladstone in Queensland, and coke, oil and aluminium fluoride purchased from overseas. The plant uses some 240 megawatts of power from the State grid on a continuous basis.

The major item of capital expenditure during the year was construction of a new anode baking furnace at a total cost of \$70 million. Expenditure during the year was \$44 million, and the project was 90% completed.

As part of the general employee welfare programme, the extensive occupational health and safety systems were continued. These included monitoring plant emissions and discharges, and maintenance of a rehabilitation program for injured employees. Land management programmes also operated in the extensive company-owned land adjacent to the plant, with the objective of conserving and improving the surrounding vegetation and wildlife.

Goliath Portland Cement Co. Ltd, Railton

Cement production was in the region of 500 000 tonnes for the year for use in the Tasmanian, mainland and overseas markets. Raw materials used included limestone and clay, quarried on site; clinker manufactured

on site; and coal from the Cornwall Coal Company.

The works uses the fuel efficient 'dry' process, and has the only twin tower full precalcination kiln for cement making in Australia.

Capital equipment purchases included a mobile crane, radio communications systems, fans and dust collection systems, and computers.

MK Silica

Commissioning of the silica flour plant commenced in July 1988, and considerable teething problems were experienced until regular production started in mid-November. The plant was officially opened by the Minister for Mines on 3 February 1989.

Total production for the year under review as 4076 tonnes of processed silica flour, all of which was shipped to Japan.

Two mining programmes were carried out on a lease near Corinna to extract approximately 11 500 tonnes of silica flour. A small pit was developed on a nearby lease towards the end of the year to recover a small quantity of very high purity silica flour for development of a first grade product.

At year-end ten operators were employed at the plant site.

Pasminco Metals-EZ, Risdon

Production of zinc and alloys totalled 199 141 tonnes, utilising sulphide concentrates from Rosebery in Tasmania, and Broken Hill and Elura in New South Wales. Concentrates are roasted in fluid bed roasters to produce zinc oxide calcine, which is dissolved by sulphuric acid to produce zinc sulphate solution for electrolysis. Zinc deposited on aluminium cathodes is mechanically stripped, melted down, and then alloyed and cast to customers' requirements.

The integrated plant produces sulphuric acid by the contact acid process, ammonia in the Haber process, hydrogen by electrolysis of water, and nitrogen from the fractional distillation of liquid air. The main by-products are cadmium metal, cobalt oxide and sulphuric acid. The latter is also used in the superphosphate plant, which converts Christmas Island phosphate rock into granulated fertiliser for the Tasmanian market. Electricity requirement is

approximately 110 megawatts on a continuous basis.

The \$150 million modernisation programme continued throughout the year, with extensive construction projects across the site. The gypsum removal plant has been commissioned, and commissioning of solution purification and zinc dust plants was underway in June. Progress was well advanced on the jarosite filtration and lead residue drying plants, and construction of calcine handling and neutral leach plants had commenced.

Pioneer Silicon Industries

This company produces silicon metal at Electrona, for the aluminium and chemical industries.

Planned production capacity of silica is 20 000 tonnes per annum. This silica is mixed with wood chips, charcoal, metallurgical coal and petroleum coke, and is subjected to a reducing arc in a 14 megawatt electric furnace. A baghouse collects flue dust, and a crushing and screening plant prepares the metal for packaging.

During the year a planned shutdown was used to refurbish furnace linings and maintain the dust handling system. Production totalled 8024 tonnes of metal.

Tasmanian Electro-Metallurgical Company, Bell Bay

Temco is the only ferro-alloy works in Australia, and satisfies most of Australia's demand. The plant is large enough to export about 50% of its production.

Progressively expanded since 1962, Temco now produces approximately 70 000 tonnes of high carbon ferro-manganese, 70 000 tonnes of silico manganese, 20 000 tonnes of

ferro silicon, and 270 000 tonnes of sinter. These are made in four furnaces and a sinter plant.

Raw materials obtained in Tasmania are quartz, limestone, dolomite, wood chips and iron-ore pellets. The raw materials imported from the mainland and overseas are manganese ore from Groote Eylandt; iron ore, quartz and coke from South Australia; coal from New South Wales; special coke from China and Japan; and electrode paste from Norway.

To ensure furnace off-gas is not wasted into the environment, a waste gas boiler produces steam for an electric turbine. This gives approximately 10 megawatts of power—nearly 10% of the total plant requirement.

A recently completed \$A80 million uprate lifted manganese alloy production capacity by 40%, removed the need for air pollution exemptions, and cut water pollution to only 6% of pre-uprate.

A major refurbishment of the Furnace 5 smokehood is planned for September 1989 to give extra life and lift production by up to 20 per cent.

Tioxide Australia Pty Ltd, Heybridge

The plant continued to produce titanium dioxide pigment by the sulphate process from ilmenite imported from Western Australia. Production and sales for the year again were in line with the company's targets.

Plant expansion and modernisation continued to be undertaken alongside normal production. These activities, together with new installations aimed at providing better environmental control, resulted in the outlay of a further \$18.88 million of capital expenditure.

DANGEROUS GOODS DIVISION

The Dangerous Goods Division recognises that public concern is greatest about risks which are involuntary, uncontrolled, unfamiliar, immediate man-made and catastrophic. Therefore, the primary objective of the Dangerous Goods Division is to provide Tasmania with a credible inspectorate for the enforcement of the Dangerous Goods Act, 1976 and Regulations.

In a modern industrialised society there is an ever-increasing list of goods, which can be classed as dangerous, produced to sustain the expectations and living standards of the population. There is also a popular opinion in some sectors of society that dangerous goods are "potentially" dangerous and only become dangerous when mishandled. If not taken too literally there is an element of truth in this premise. However the fact remains that there is no such thing as safe dangerous goods, only SAFE manufacture, handling, packaging, storage and transport of such goods.

DANGEROUS GOODS ACT 1976

There were no amendments or additions to the Dangerous Goods Act, 1976 during the year. Amendments to the Dangerous Goods Regulations were tabled to come into effect on 8 March 1989. The amended Regulations provide for reducing the period for the sale of fireworks from two weeks to one week, from the 18 to 24 May in any year.

The Dangerous Goods Act, 1976 and Regulations are in place to ensure the safe manufacture, handling, packaging, storage, transport, import and export of all classes of Dangerous Goods, except Class 7 radioactive materials. The principles of classification and definition of classes include the listing of the principal dangerous goods, general packing requirements, testing procedures, marking, labeling or placarding, and shipping documentation.

In addition, the Dangerous Goods Act, 1976 and Regulations call up the International Maritime Dangerous Goods Code (IMDG) and the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG) code. The Act also calls up approximately fifty Standards Association of Australia (SAA) codes, and the Australian Liquid Petroleum Gas Association (ALPGA) and Australian Gas Association (AGA) codes.

Although Australia has embraced multimodalism which would imply harmonised transport regulations, a one hundred per cent consistency between the various sets of regulations has yet to be achieved. However the regulations do represent a complex set of inter-related international, national and State legislative controls and codes of practice to be enforced by the Dangerous Goods Division. Where there has been a general lack of compliance with legislative controls and codes of practice, experience indicates it has resulted largely from their complexity.

In order for the Dangerous Goods Division to positively influence international and national legislation in the manufacture, handling, packaging, storage and transport of Dangerous Goods, the Division participates in the following working committees:

- Australian Conference of Chief Inspectors of Explosives
- Australian Committee on the Transport of Dangerous Goods; Working Group on the Transport of Explosives.
- Australian Committee on the Transport of Dangerous Goods; Drafting Sub-Committee.
- Advisory Committee on the Transport of Dangerous Goods; Competent Authorities Sub-Committee.
- Australian Minerals and Energy Commission; Working Party on Uniform LPG/LNG Legislation.
- Standards Association of Australia Committees; ME/15 LP Gas.
- Standards Association of Australia Committees; ME/17 Flammable and Combustible Liquids.
- Standards Association of Australia Committees; CE/5 Explosives.
- Australian Liquid Petroleum Gas Association Committee.
- Tasmanian Hazardous Substances Management Committee.

- Southern Regional Disaster Planning Group.
- State Pesticides Working Party.

STAFF

The Division at full strength has a staff of nine but has experienced shortages during the year due to the retirement of one inspector and the resignation of another at Launceston. The present strength of the Division is seven, with one inspector on 50% Dangerous Goods Inspection and 50% Mines Inspection duties. This will consequently affect the scope and quality of service provided by the Division, especially in the role as educator and adviser to the public, as emphasis will be placed on the training of new inspectors.

This year has seen the implementation of ADCHEM, a computer data base of all dangerous goods known to be present in the State. A computerised hazard analysis program (WHAZAN) is being experimented with, whereby the effects caused by flammable or toxic chemical releases may be predicted.

Communications with Inspectors have been improved by the issue of a radio 'Pager' to each Inspector. The 'Pagers' are proving to be an effective tool in the improvement of field work efficiency.

The number of field inspections covering import, export, storage and handling, use and sale increased to 2963 from 2726 in 1987-88.

The explosives magazine at Dilston has had a busy year, with issues up by 34%, deposits up by 12%, and a 30% increase in revenue.

ACTIVITIES

All imports in bulk of Class 1, 2.1, 3.1 and 3.2 dangerous goods through the ports of Burnie, Devonport, Hobart and Launceston were supervised by Inspectors of the Division. Statistical details are given in Tables 14-16.

Enquires and appeals for assistance in the disposal or destruction of dangerous goods of all classes continue to increase. Requests for assistance on the disposal of any hazardous material which cannot be properly disposed of at the premises at which they are kept are referred to the Department of the Environment and Planning, as the relevant authority.

The Division will continue to assist and advise on the co-ordination, packaging and storage of hazardous material prior to disposal. The Division has no mandate to deal with the ultimate disposal, destruction or clean up of hazardous waste. However a close liaison is maintained with the Department of Environment and Planning, including active participation in the development of a State Hazardous Substance Management strategy.

The Division has continued to provide the Department of Agriculture with assistance and advice on the collection and packaging of banned pesticides to centres within the industry at Hobart, Cressy and Forth prior to disposal in Victoria.



Dangerous Goods Inspectors David Wildmore and Maurice Robertson inspecting an LPG installation at the Derwent Park factory of Sheridan Domestic Textiles.

Assistance with the destruction of explosives was requested and provided on fourteen occasions

LECTURES AND SEMINARS

Lectures on explosives were given on two occasions to the Department of Main Roads and the Burnie Technical College, and lectures on the Dangerous Goods Regulations were given on four occasions to industry.

A new shotfirer's training programme and examination criteria is being developed. On implementation, the shotfirer's permit will be valid for five years, with training and revalidation necessary every five years.

A proactive safety campaign was put into effect during the fireworks season in co-operation with the media, centred on the Division's video "Fun with Fireworks". Inspectors were interviewed on TVT Channel 6 News, radio 7HT and 7ZR, and articles on the safe handling of fireworks were published in the *Mercury*, *Southern Star*, *Examiner* and *Advocate* newspapers.

A manned display at Claremont Village Shopping Centre was used to promote the safety campaign and provide the public with an appreciation of the work of the Division in testing and controlling the sale of fireworks.

FIREWORKS SEASON

The strategy of the Division for the 1989 season continued to be a co-ordinated approach for the import, testing and education of the public on the safe handling of fireworks.

The Department of Health Services reported eighteen injuries requiring hospital treatment, with only one person having sufficiently severe injuries to be admitted for treatment. It is interesting to note that "sparklers", considered to be the safest firework by the public, pose a substantial danger, and accounted for 28% of the injuries.

There were 410 complaints to the Police; this figure represented an increase on the previous year. However most complaints concerned juvenile mischief and vandalism, with nineteen prosecutions relating to misuse in public places. The Tasmania Fire

Service reported seven call-outs, with minimal damage to property.

The Department of Health Services, Tasmania Fire Service and Tasmania Police have agreed that the shortened fireworks season was a considerable success, and that its retention for future years would carry their support. The job of enforcing fireworks legislation is particularly difficult, as State legislation permits the widespread private use of fireworks. The majority of the Tasmanian public do act responsibly, and there are indications of public support for further restrictions in order to take fireworks out of the back-yard situation and towards organised community displays.

INCIDENTS

There were forty-four incidents involving dangerous goods investigated, and those of particular significance are summarised according to class.

Class 1 Explosives

A car driver was burnt to death in a collision with a runaway baggage trailer on the Midland Highway near Epping Forest. The trailer contained Class 1.3 explosives (propellant powder) and printers ink, together with other miscellaneous items. The trailer rolled over the top of the car on impact, simultaneously spilling propellant powder over the exterior and interior of the vehicle through the broken windscreen. A fire, allegedly started by electrical short circuits to the vehicle's collision-damaged wiring system, rapidly escalated and frustrated all attempts to save the driver. This accident highlights the risks of carrying dangerous goods by road vehicle.

A second incident concerning a runaway trailer occurred on the Tasman Highway when a four-wheeled compressor ran off the highway into the bush and overturned. The driver of the towing truck did not stop but later returned to the scene of the accident. Meanwhile, police at the scene of the incident discovered that the compressor contained Class 1.1D explosives. The truck driver told the Police that he had been told to transport the explosives after attaching the trailer at a mine works, and denied knowledge of the requirements for the marking of vehicles when carrying explosives.

A Scania truck parked in the Newnham district of Launceston was damaged by explosives being placed in the diesel fuel tank. The blast failed to detonate the main charge, and the ensuing fire was extinguished by the owner of the truck and no one was injured. The Police Bomb Squad investigated the incident.

Class 2.1 Flammable Gases

A Hobart high school was evacuated without incident when an LPG escape occurred in the science block. The staff at the school were commended by the Tasmania Fire Service for their immediate actions in shutting the gas master valve in the laboratory, and in the manner in which they evacuated the area. Investigations revealed that a pipe carrying the LPG had been cut by a plumber to facilitate the removal of laboratory benches. The plumber was not a registered gas fitter, and his irresponsible actions put many lives at risk.

A Burnie laundry fire occurred when the LPG tank ran out of gas, causing the vapouriser to overheat due to lack of liquid in the unit. The high temperature cut-out failed, causing the paint on the unit to blister before it was switched off manually. There have been recurrent problems with the safety aspects of vapourisers, and this incident resulted in the gas suppliers carrying out a statewide safety inspection of all units.

Class 3 Flammable Liquids

A customer at a Seven Mile Beach store inadvertently drove off with a fueling nozzle still inserted in the car fuel pipe. The petrol bowser was torn from its mountings, breaking the anaconda assembly and power supply cable. The resulting fire destroyed the bowser, with heat damage to the bowser canopy.

A Burnie home was gutted as a result of the occupant flicking petrol onto a smouldering fire in an attempt to ignite the fire. The family cat distracted the owner, causing petrol to spill and ignite on the floor. In the process of trying to extinguish the spill, the petrol container was kicked over. The occupant was lucky to escape, and the incident highlights the dangers of having any flammable liquids whatsoever within the home.

Class 4.3 Substances Emitting Flammable Gases when Wet

Whilst opening the hatches of the *Bunga Melor* at Number Five Berth at Bell Bay, five waterside workers were affected by fumes. Three containers of Sodium Ethyl Xanthate Class 4.3 with a subsidiary risk 5.1, were identified as the source of the fumes. It is thought that substandard packaging, aggravated by poor container stuffing techniques, allowed the lids of the drums to spring. This permitted ingress of moisture to the powder causing exudation of carbon disulphide gas. This was the second of two recent incidents involving shipments of this product from China, despite approaches to the Chinese authorities on packaging. There is difficulty in enforcing a requirement for better packaging because the substance is not listed in the International Maritime Dangerous Goods Code, and the United Nations Committee of Experts cannot agree on its inclusion.

Class 6.1 Harmful Substances

An incident at Pardoe Airport involved the spillage of ten litres of dilute "Lorsban" pesticide, when a maintenance fitter accidentally released it from the sump of a crop spraying aircraft. The fitter attended hospital, and although not detained was extremely fortunate that the spillage was substantially diluted. The incident highlights the need for care when operating in and around equipment where dangerous goods are involved.

Class 8 Corrosives

A chemical reaction led to the evacuation of a Launceston factory when white acrid fumes emanated from a drum of Hydroxylamine Sulphate. The incident occurred during a rest break, and no employees were exposed to the fumes. The most likely cause of the reaction is thought to have been the absorption of moisture over a period of time, either through the cardboard walls of the drum or the rusted metal base. This formed a localised "hot spot", which started a chain reaction that was self-perpetuating. The chemical is now stored in a plastic container. The incident serves to highlight the need for careful management in the handling of chemicals in the work place.

REGIONAL GEOLOGICAL MAPPING BRANCH

An additional geologist was recruited in the latter part of the financial year. The branch now operates with a staff of ten geologists, which allows regional systematic and multi-purpose mapping to continue at about 90% of the level attained in 1984.

The State is divided into 79 map sheets of the 1:50 000 scale Geological Atlas Series, of which 57% have been published or are being prepared for printing, with field work proceeding in a further 11% of these map sheets. Explanatory Notes detailing field observations and subsequent laboratory investigations of the material collected during mapping are published for each map sheet within some two to three years of map publication.

The geology of Tasmania varies so considerably over short distances that most map sheets require a number of geologists working as a team to cover all the specialities (stratigraphy, structure, petrology etc.) needed to adequately investigate the geology. Occasionally, however, the geology of some map sheets is of a more uniform nature and it can be mapped by one geologist.

As completion of a 1:50 000 map sheet involves more than three years of work, results of component investigations can be made available as they come to hand.

Corinna Map Project—Mapping of the quadrangle has been completed and the work is being compiled for publication. The map includes the distribution of the enclosing metamorphic rocks of the massive sulphide-oxide deposits of Savage River, the complicated relationships between the Oonah Formation and younger sequences, and the variations in the Meredith granite batholith. Publication is planned for 1989–90.

Snow Hill Map Project—Work on this map sheet has been compiled for publication. Points of interest include the local intricate distribution of the St Pauls granitoid types, the unexpected occurrences of Parmeener Supergroup rock units in amongst extensive areas of Jurassic dolerite, and the uneven floor of the Tertiary deposits. Publication is planned for 1989–90.

Woolnorth Map Project—More than 80% of the region has been mapped. The unconformable western boundary has been traced between the rocks of the Smithton Basin and the underlying uniformly-folded dominantly quartz sandstone sequences of the basement. Much more outcrop of older rock units than anticipated was encountered in areas predominantly covered by Cainozoic deposits.

Alberston Map Project—Granitoid rock types are being mapped throughout the quadrangle, and the extent of the contact metamorphic aureole within the Mathinna Beds is being determined. The structure and rock-unit types of the folded Mathinna Beds will be carefully examined, together with gold-bearing quartz veins, with a view to establishing relationships. Vein patterns are being analysed.

Regional mapping continued in the Point Hibbs, Trowutta, Styx and Dover Map Projects, and commenced in the Swansea region.

Explanatory Notes

Explanatory notes for the Smithton Quadrangle are in press, and notes for Pedder, Lake River, St Helens and Ben Lomond 1:50 000 map sheets are being compiled.

The Palaeontologist continues determining time constraints on rock units through studies of Late Palaeozoic brachiopods. Four bulletins on palaeontological studies of the Lower Parmeener Supergroup are to be produced in the next few years.

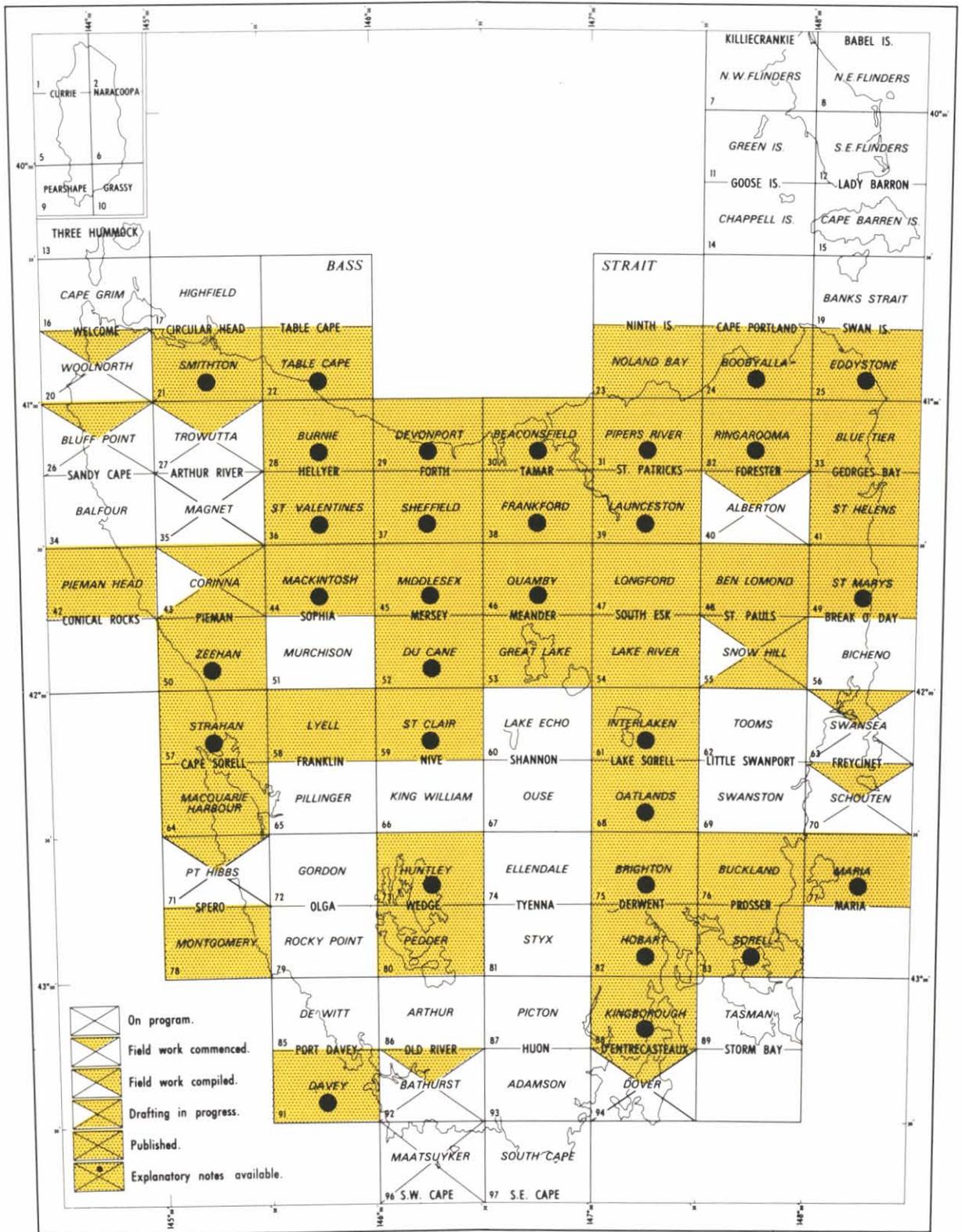
Palynofloras continue to be used to determine the time constraints of economically notable units of the Triassic and Tertiary.

Other projects

Contributions have been completed for the Australian Bicentennial Tasman Fold Belt System map and explanatory volume, and the lithosphere transect study of the International Lithosphere Program. A number of members of the branch had major contributions published in the Geological Society of Australia's Special Volume *The Geology and Mineral Resources of Tasmania*.

GEOLOGICAL ATLAS MAPPING PROGRAMME

1:50 000 and 1:63 360 scales



ECONOMIC GEOLOGY BRANCH

Despite some restructuring in the Department, the branch strength remains at ten but the composition has changed. The geochemist and his technical assistant have left the branch to form their own section. The vacant geological position has been filled by a geologist to be employed in mineral resource mapping.

One geologist has been temporarily seconded to the Resource Development Division in the environmental monitoring role. With the recent addition of the two lapidary officers, the composition of the branch is now seven geologists and three technical officers.

REGULATION

Regulation of the mineral exploration industry continued to be an important function of the branch. Exploration programmes, reports (149), and renewal applications were assessed for 161 exploration licences and 28 retention licences.

Exploration tenders (17) were also processed by the branch for 62 areas advertised under the Exempt Tender Area (ETA) system, and 23 new exploration licences were awarded.

MT READ VOLCANICS PROJECT

About half of the branch resources continue to be committed to this special project. Six temporary employees are fully involved in the component projects; these comprise two geologists, one analyst, one file/input clerk, and two draftsmen.

Mineral Resource Mapping

Production of the 1:25 000 map series on the Mt Read Volcanics belt continued, with mapping of the Winterbrook–Moina area being completed. This map, the ninth in the series, will be printed in November 1989.

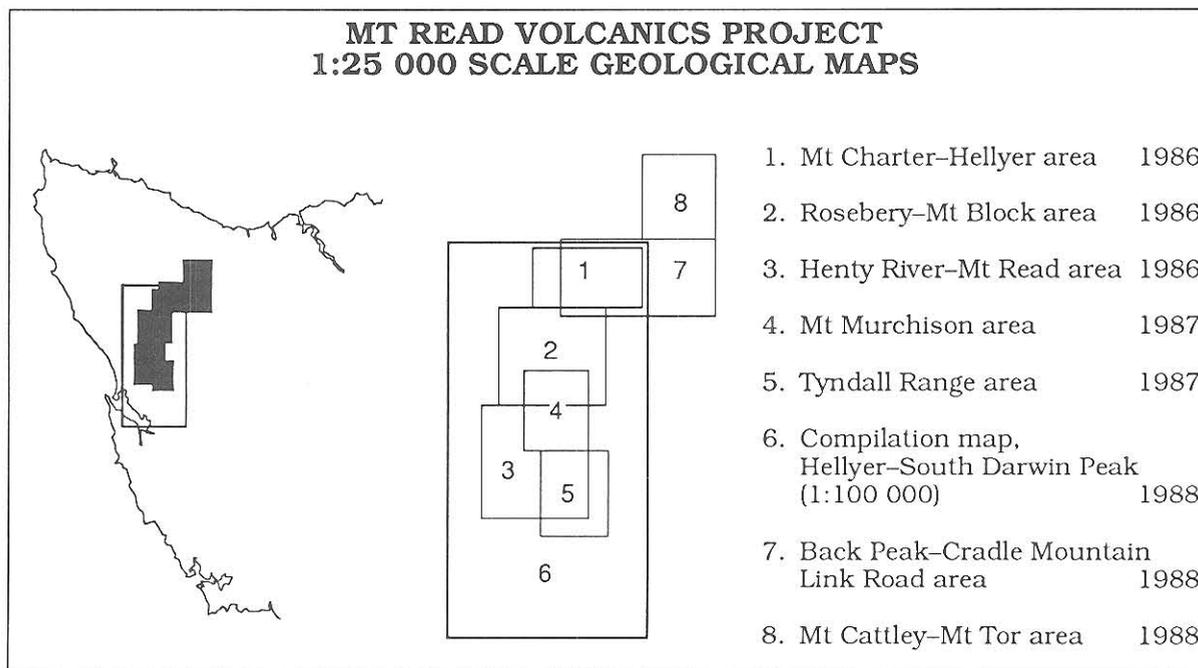
A joint project between Dr K. Corbett and three geologists from the Regional Mapping Branch resulted in re-mapping of a significant part of the Queenstown area during the summer of 1988–89. This work will be published as a special 1:25 000 scale Queenstown map sheet in October 1989. The work has revealed some exciting geological features in the Mt Owen area, and some interesting correlations of the volcanic sequence with the Hellyer–Que River area.

The first of the Mt Read Project Geological Reports, on the important Hellyer–Mt Charter area, was scheduled for publication in August 1989.

Isotope and Alteration Studies

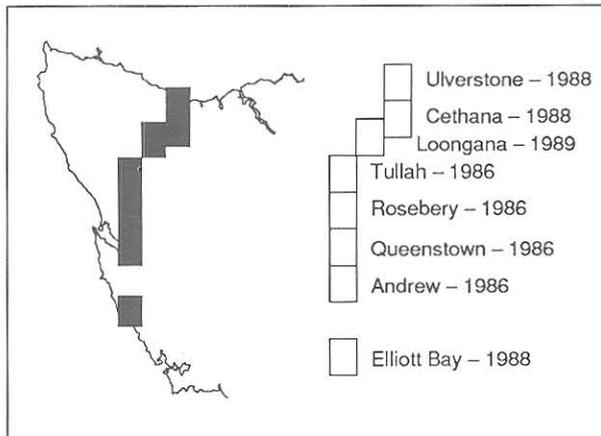
The study of complex gold-tin mineralisation in the Sterling Valley area has been completed and a report will be published next year. An integrated study of the mineralisation, alteration, stable isotope geochemistry and fluid inclusions of the Henty Gold Prospect has commenced. Reports on the alteration haloes around mineralisation in the Hellyer, Hercules and Boco areas will be completed next year.

Specialist consulting services continue to be provided to a number of companies engaged in mineral exploration in western Tasmania.



Mineral Deposit Maps

This project continues to produce 1:50 000 scale maps showing the commodities and style of mineral deposits in the Mt Read Volcanics and adjacent areas. The maps in the series produced to date are shown below.



Most of the Mt Read Volcanics area has been covered by the maps. Production of further maps has been deferred until the geological mapping base of the remaining areas has been upgraded.

Technical Data Bases

The objective of this project is to provide industry with computerised data bases relevant to mineral exploration and mining in the State.

TASXPLORE: a data base of unpublished company exploration reports containing details on over 3000 reports, and is constantly being updated. Several output options are available. Microfiche of all open file reports are available for purchase.

DOMINFO: indexing for a data base on departmental publications commenced in early 1989. It will be operational by the end of the year for reports from 1970 to the present. A report has been written on the design of the data sheets. Other data bases, still being completed, but available for consultation are:

TASROCK: a rock and mineral data base

MIRLOCH: a mineral deposit data base

CHEMDAT: a data base for chemical analysis

DORIS: a drill log data base

CORDAT: a core location index

Sub-basalt Drilling Project

The drilling programme to determine the nature of the Palaeozoic basement below the Tertiary basalt in the Waratah region has now ended. The area has been returned to the Mining Act and has been made available for exploration by mining companies using the information generated by the project.

COMMODITY STUDIES

Gold

The data base of Tasmanian gold deposits (on MIRLOCH) is nearing completion, with 866 gold-bearing deposits recorded. Research on lode gold deposits is being compiled into maps and reports for the NETGOLD Project, initially on the Mangana-Mathinna area. Specific investigations included reconnaissance surveys at various sites between Fingal and Alberton, and in the St Marys area.

Reports were produced on the Henty Prospect gold mineralisation, a supposed gold discovery at Edith Creek, and the gold content in parts of the King River gravels. Studies continued on the gold distribution in Mt Lyell ores and concentrates, and a paper is being co-authored for "Economic Geology" on parts of this study.

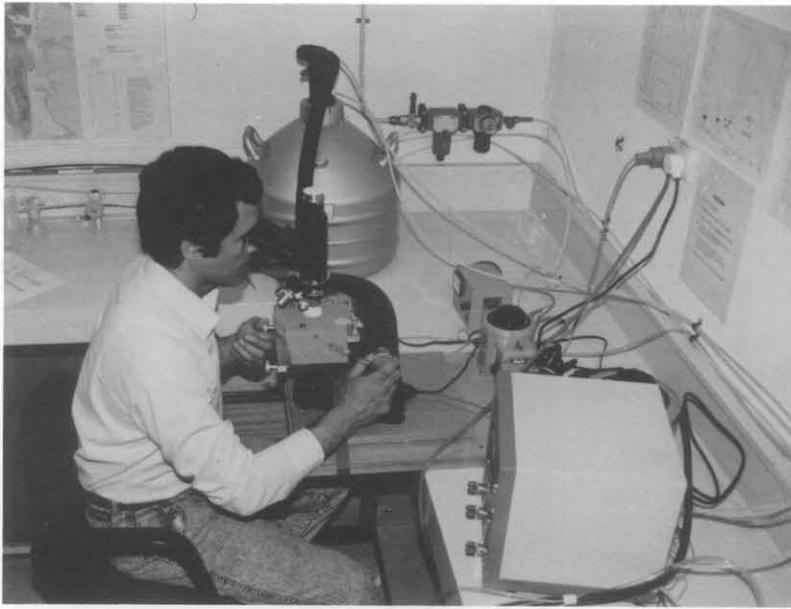
Investigation of gold mineralisation at Jane River has been carried out by geological mapping, assaying, petrography, palynology, geochemical sampling and heavy mineral studies. The results document bedrock sources of gold as well as the already known alluvial deposits.

The NETGOLD project, which is to carry out geological, geochemical and geophysical studies of gold occurrence in the north-east, is currently delayed due to lack of funds.

Industrial Minerals

Restricted progress has been made on these commodities due to the geologist being seconded to another Division for environmental monitoring.

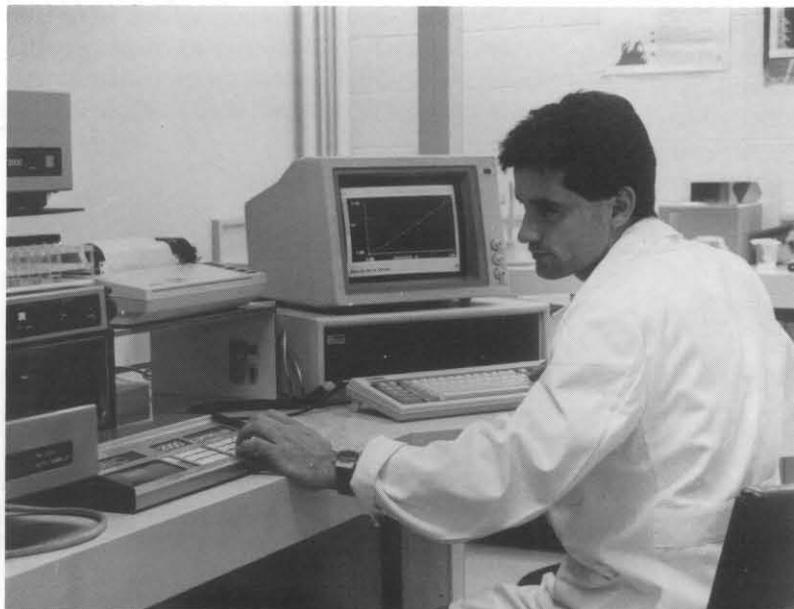
Reports were written on salt, wollastonite, granite and marble, while reports on heavy-mineral rich beach sands, clay and carbonates are in progress. A comprehensive survey of the State's silica resources was prepared for printing as part of the Mineral Resources series.



Geologist Jafar Taheri studying fluid inclusions using a USGS heating-freezing stage.



Technical Officer Richie Woolley using the X-ray diffractometer to determine the crystalline silica content of a dust sample.



Laboratory technician Neil Hackett operating the atomic absorption spectrophotometer in the geochemical laboratories at Rosny Park.

Coal

The publication of the Coal Resources Bulletin has been delayed because of rescheduling of the increased number of Departmental publications. It is now scheduled for publication in 1989-90.

Other commodities

Because of priorities in other areas, reviews on the silver-lead-zinc and tin-tungsten resources have not been produced. A report on alluvial tin and an historical account of work at the Jane River goldfield are being compiled.

PETROLOGY

Samples were received for investigation from a wide range of external sources, including the HEC; DMR; Department of the Environment; Health Services; Lands, Parks and Wildlife; Rivers and Water Supply Commission; The Tasmanian Museum and Art Gallery; The Government Analyst; various mining, exploration and other companies and businesses; consulting geologists; and the general public. Samples studied include geological materials (basalt, clay, chert, mineral concentrates, dolerite, gems, rocks, soils, sand, and ore samples) and anthropogenic materials (aboriginal artefacts, asbestos, dusts, industrial materials, metallurgical products and wastes). In the occupational health field, 228

dust, 185 asbestos and 93 miscellaneous samples were described, identified or tested on a contract basis.

Reports were completed on wollastonite, palygorskite, basalt, shore sediments and on classification of water samples in the Department collection.

Investigations in progress include heavy minerals in beach sands, REE-bearing phosphate minerals near Legerwood, and ore petrology of samples from the Jukes Proprietary, Anchor and Round Mount mines, and Anio Creek. A large number of rocks (270) have been petrographically described for the Mt Read Volcanics data base. Curatorial work has included the supervision of the rock and core stores, and upgrading of data bases for rock samples, drill logs, drill core, mineral deposits and chemical data. An exhibition was prepared and manned for the National Gem and Mineral Show ("Gemboree") at Devonport.

A conference on applied mineralogy and petrology was attended in Sydney to become familiar with the latest techniques.

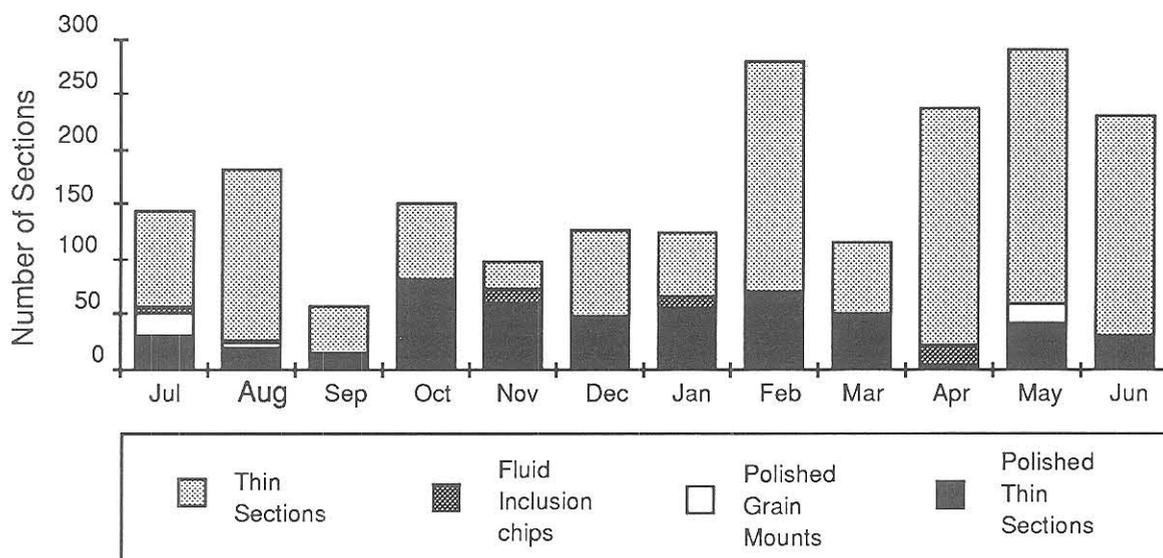
Petrology Laboratories

The lapidary laboratories prepared 515 polished thin sections, 1429 standard thin sections, and 93 miscellaneous sections, making a total throughput of 2037 samples. The technical officer for petrological services



Field Assistant Janine Triffett checking thin-section rock slides.

LAPIDARY PRODUCTION 1988-89



processed 482 samples by X-ray Diffraction, including 174 quantitative dust analyses and 109 quantitative clay analyses. He also conducted 102 stable isotope analyses and 171 optical asbestos identifications.

GENERAL

The following publications were produced during the year:

- 14 reports
- 1 MRVP geological map report
- 1 MRVP geological map, 1:25 000 scale
- 2 MRVP mineral deposit maps, 1:50 000 scale

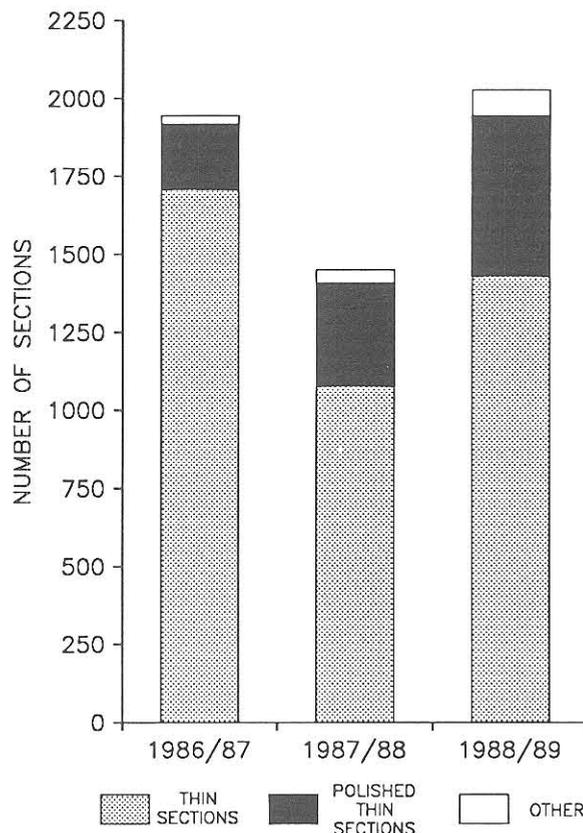
Contributions were prepared for the economic geology components of the Pedder, Smithton and Lake River explanatory notes.

Three papers were written for inclusion in the volume *Geology of the Mineral Deposits of Australia and Papua New Guinea* being produced by the Australasian Institute of Mining and Metallurgy.

The construction of the new core store at Mornington is underway and the racking system is currently being built by the Devonfield complex, Devonport. On present indications, the store should be operational in the second half of 1989-90.

Branch members have been involved in assessing the mineral resource potential of various parts of the State. Assessments were

LAPIDARY PRODUCTION 1986-87 to 1988-89



provided to Government for the current World Heritage Nominations and to other State Departments for the likely impact of Rain Forest Reserve Proposals on the mining industry. The branch is also contributing to a project aimed at establishing the influence of bedrock geology and soils on the control of rain-forest types.

ENGINEERING GEOLOGY AND GROUNDWATER BRANCH

Staff over the year comprised one supervising geologist, two senior geologists, three project geologists, one temporary geologist employed on the Geodata project, and one surveyor. The Supervising Geologist retired in early December and one of the senior geologists has been acting Supervising, and later acting Deputy Chief Geologist. One of the project geologists spent a large part of the year on sick leave.

The work of the branch has consisted of long-term data collection projects, and providing an advisory service to the public, Local Government, other Government departments, and companies. Staff undertaking long-term projects have been left largely free from advisory service work. There has been a significant increase in work involving disposal sites and their possible effect on groundwater quality.

LAND STABILITY

A major study of land stability and engineering properties of soils has been completed at Blackstone Heights, a large new subdivision in West Launceston. Similar reports have been compiled on stability conditions at Orana Place (Riverside), Bell Bay, and Round Hill (Burnie). A large number of individual lots and subdivisions have been examined and stability advice given. These subdivisions have mainly been located along the North West Coast and in the Tamar region. Slope movement has continued to be monitored at several localities including Penguin, Windermere (Tamar), Launceston, Rokeby and Taroon.

GROUNDWATER

Investigations in the Sheffield area continued, and included drilling, electric logging, pump testing and water quality analyses in the last half of the year. Contract water boring, combined with some investigative drilling, was undertaken in the North East in the first half of the year. Compilation of this project is proceeding. Information on existing bores in the Sorell area has been compiled.

Historical information on water problems at the Beaconsfield gold mine has been examined at the request of the company at present dewatering the mine. This was to aid in identifying sources of inflow as well as giving guidance to the likely drawdown pattern during the dewatering process.

Monitoring of groundwater levels, output and water quality has continued in the Devonport-Port Sorell-Sassafras area.

A university honours project to examine possible salinity layering at Seven Mile Beach was supervised.

Regulations associated with the Groundwater Act (1985) have been finalised.

The Groundwater Committee has met twice, once in Launceston and once in Devonport. The latter meeting was combined with a field tour of the nearby monitored area and drilling operations at Sheffield. Private contract water drillers and representatives of the Tasmanian Farmers and Graziers Association attended.

Numerous property inspections have been made to assess groundwater prospects throughout the State at the request of owners.

A submission to the Australian Water Resources Advisory Council for funds to examine possible groundwater contamination in Tasmania has been prepared.

FOUNDATIONS

Investigations of foundation conditions of reservoir sites at Otago Bay, Dysart, Clarendon Vale and Cambridge have been made. Advice has been given on foundations at the Bathurst Street car park, piling at the Pasmenco-EZ Risdon plant, and a block of units at New Town. Pipeline routes at Mangalore, and Ridgeway to Kingston have been examined, while vibration monitoring was undertaken at the Ridgeway dam. Loading of proposed sewerage ponds at a near-shore site was studied at Cygnet, while a site for a water storage dam at Nubeena was examined. Drill hole core from a possible tourist mine adit at Zeehan was inspected.

GEODATA

The combined Local Government-Department survey of soils and their engineering properties in the Hobart area is proceeding with field surveys, sample collection and testing, and map compilation. Discussions have been held with North West and Launceston area councils to arrange similar surveys.

DISPOSAL AREAS

Areas for disposal of fish waste have been examined at Recherche Bay, Bruny Island, Strahan and Judbury. Abattoir waste disposal areas have been inspected at Beaconsfield, Ulverstone and Mole Creek, while household refuse disposal areas have been inspected at Scamander, Wynyard and Exeter.

SOIL CONSERVATION

Advice has been given to the Forestry Commission on erosion problems on the East Coast and in South East Tasmania, as well as the Wesley Vale concession in the central north. An application has been made to the National Soil Conservation Program for funds to undertake a survey of dispersive soils throughout the State and assess their relationship to geology.

SURVEYING

The surveyor has been involved with surveys of water bores at Seven Mile Beach, Sheffield, Port Arthur, and Scottsdale, and with landslide monitoring along the North West Coast and in the Tamar, Rokeby and Tarooma areas. Plans have been produced of quarries at Leslie Vale and Round Hill. Bore holes have been surveyed at the Meander Dam Site, and in the Zeehan and Waratah areas. Surveys of mining lease boundaries have been undertaken at Dalmayne, Anchor Mine and Scottsdale, while seismic spreads were surveyed at Boco Siding.

CONSTRUCTION MATERIALS

Seismic surveys have been undertaken on possible quarry sites (crushed blue metal) at Chigwell and near Proctors Road. A detailed survey of reserves at the quarry at Leslie Vale was also made.

CONFERENCES AND WORKSHOPS

The following were attended by Branch members during the year:

- Australian and New Zealand Geomechanics Conference (Sydney)
- Mine Water Congress (Melbourne)
- Groundwater Modelling Workshop (Adelaide)
- Geographic Information Systems Conference (Sydney)

- Surveying Conference (Hobart)
- Symposium on Landslides (Launceston)
- Tasmanian Enterprise Workshops (Hobart and Launceston)

MISCELLANEOUS

Members of the branch have been involved with the teaching of a course of "Geology for Engineers" at the University of Tasmania, and a geology course at the Hobart Technical College. A course on geology and geohydrology was given at a seminar on Whole Farming Planning.

Computer programmes which deal with the work of the branch have been developed, and applications of the work to the Geographic Information System are being noted.

PETROLEUM EXPLORATION AND MARINE GEOLOGY SECTION

GENERAL

The Section is responsible for technical and policy aspects of petroleum exploration in Tasmanian offshore and onshore areas, and in addition to providing technical advice concerning administration of the relevant Acts, performs reviews and conducts research projects relating to the geological evolution and prospectivity of the offshore and onshore sedimentary basins. The section is staffed by the Petroleum Geologist, and receives specialist input from other Departmental officers as required.

The annual conference of the Australian Petroleum Exploration Association (APEA) was held in Hobart during April, and two of the papers presented at the conference and published in the APEA Journal were co-authored by the Petroleum Geologist. Over seventy conference delegates took part in an excursion to the Gordon River and Cape Sorell areas, which was used to help promote the release of offshore acreage in the Sorell Basin.

OFFSHORE

Current offshore exploration permits are shown in Table 2. Exploration continued at the low levels of the previous years. A marine geochemical ("sniffer") survey by Amoco and partners in T/14P, T/18P and T/22P acquired over 2000 line kilometres of new data.

Table 2

OFFSHORE PETROLEUM EXPLORATION PERMITS

<i>Title</i>	<i>Holder</i>	<i>Blocks</i>	<i>Expires</i>
T/14P	Amoco Aust. Petroleum Co. and others	25	24.8.92
T/15P	Weaver Oil & Gas Corp. Aust. and Dorchester International Inc.	136	26.5.92
T/18P	Amoco Aust. Petroleum Co. and others	59	24.8.92
T/22P	Amoco Aust. Petroleum Co. and others	52	3.9.90

During December the Bureau of Mineral Resources acquired 1090 km of seismic reflection data in the Bass Basin, mainly in the Boobyalla Sub-basin (Project 9131.12: Deep structure of the Gippsland and Bass basins), together with a small amount of data in the Tasmanian sector of the Gippsland Basin.

In April the Joint Authority (the Commonwealth Minister for Resources, and the Tasmanian Minister for Mines) announced that four Tasmanian offshore areas (three in the Bass Basin, one in the Sorell Basin) had been made available for work programme tender, as part of the First 1989 Release which consisted of some twelve areas on the Australian continental shelf.

Work commenced in April on the indexing of the offshore petroleum exploration database; by the end of June 185 reports and surveys had been completed. Sixty-seven disks of well-log data of all Bass Basin wells were received courtesy of Wiltshire Geological Services (WGS), Adelaide. Subsequently, WGS commenced work to produce a set of data cards summarising all the available information about each of the wells.

ONSHORE

The consolidation of all licences held by Conga Oil Limited into a single large licence (EL 29/84) has enabled that company to more efficiently continue their search for Ordovician-sourced hydrocarbons beneath the Tasmania Basin.

GEOPHYSICS**GRAVITY-MAGNETICS**

Gravity data acquisition continued throughout the State. In a new initiative joint ventures with the exploration industry involved the acquisition of data at Cethana (259 stations), Balfour (639 stations) and the northern Midlands (1251 stations). Other areas of operation were Burnie (341 stations), Cuni (119 stations), Boco (60 stations) and

Sorell (8 stations). Several parcels of gravity data have been reduced for other operators.

The granites of west and north-west Tasmania and their relationship to mineralisation were discussed in the recently released Geological Survey Bulletin 66 and, as a result of the gravity models used for this interpretation, it has been possible to define the Moho depth. By removing both the Moho and water effects from the Bouguer anomaly data a series of residual gravity maps have been produced.

Early in 1989 the Department had the Mangana-Alberton area flown aeromagnetically and radiometrically using a flight line spacing of 500 m and a nominal terrain clearance of 150 m. This was a precursor to flying the entire north-east region. The results showed a magnetic low to be associated with the gold belt. The Bureau of Mineral Resources has completed an aeromagnetic coverage of the State (including King and Flinders Islands) with a 1500 m line spacing, and the data is now available.

PHYSICAL PROPERTIES AND SIGNATURE STUDIES

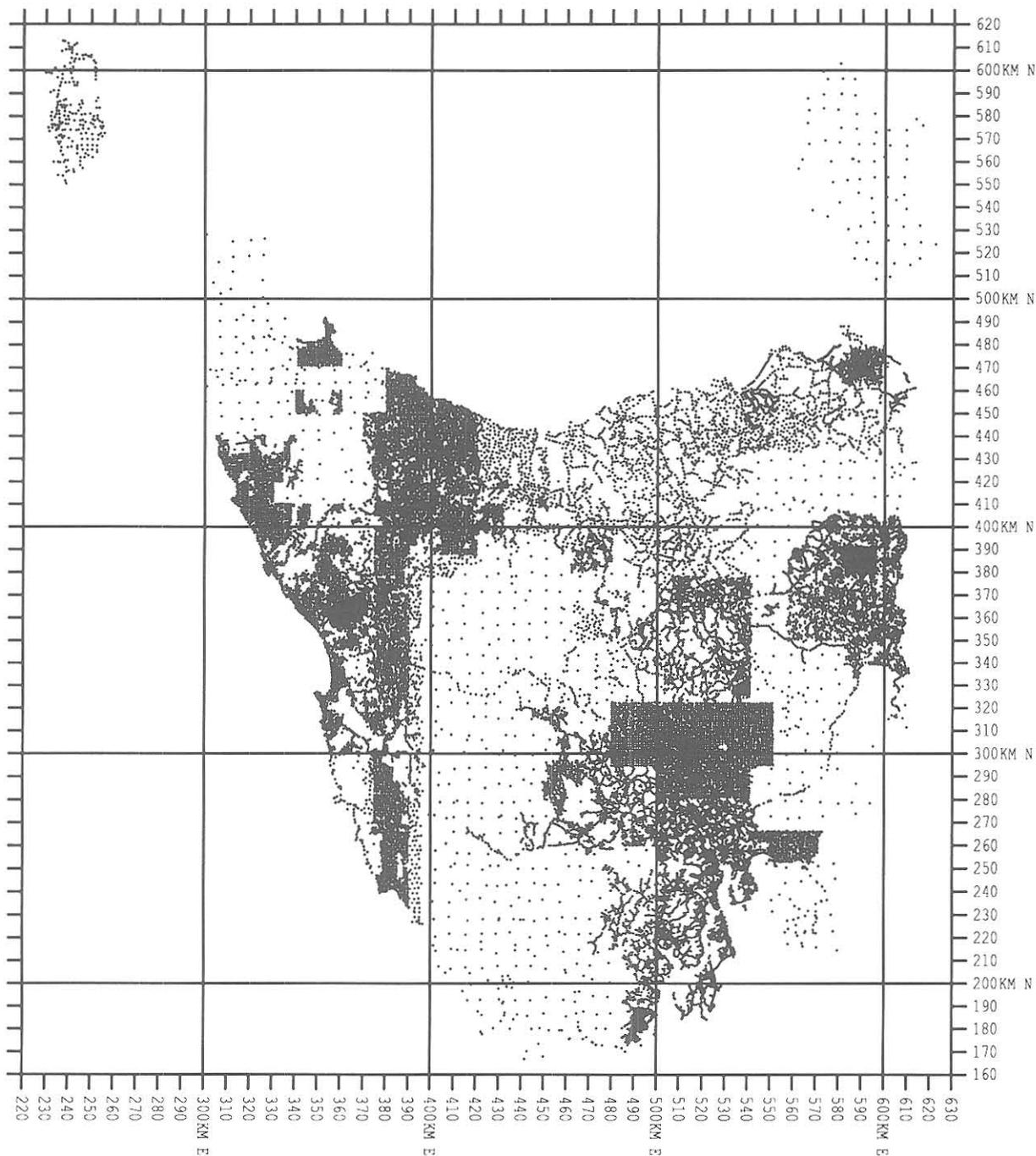
The final report for the Mt Read Volcanics Signature Study Project has been received and, when combined with the earlier reports on the gravity and magnetic signatures and investigations at Boco Siding, provides an excellent guide to the geophysical responses of western Tasmanian materials.

A total of 420 bulk samples have been collected and measurements of physical properties and natural site radioactivity made. Petrological descriptions and chemical analyses of the samples are continuing. Data for drill core from Renison, Rosebery and Que River has been corrected and tabulated.

COMPUTING

Use of the mini-computer has continued at a high level, with heavy demands being made by gravity and magnetic data processing.

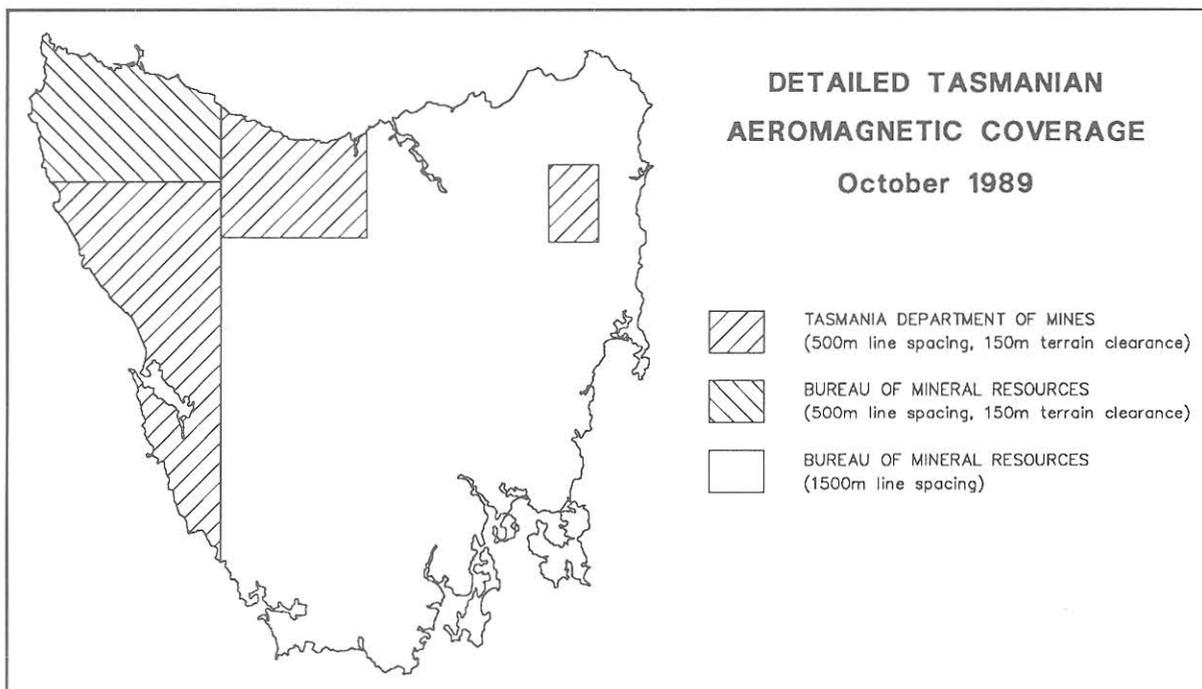
DISTRIBUTION OF TASMANIAN GRAVITY STATIONS



Linking and sharing of peripherals has continued, and with the appointment of a Computer Services Manager is expected to proceed more rapidly. New programs have been written for the offshore petroleum exploration data base and for archiving the wireline logger data, and modifications have been made to the mineral exploration data base, the rock catalogue data base, the construction materials data base, the mineral deposit data base and the mining lease data base. A digital terrain model of the State is available.

ELECTRONICS

The two major projects for the year were the construction and testing of the synchronised shot boxes and the design, construction and installation of a 36-sample carousel for the X-ray fluorescence spectrometer at the Launceston laboratory. Other projects undertaken include preparation of radiation safety guidelines for internal Departmental use, documentation of all Unidata installations, and repair of the magnetic susceptibility tool. Maintenance of the GBC



atomic absorption spectrophotometer continued to be a major problem, and a complete evaluation of the system is planned.

GEOCHEMISTRY

Development of the Huminex geochemical exploration system continues to be the main task of this section. Modifications to the soil application of the system have improved the sensitivity for several elements. Gold, silver and arsenic are now available in addition to the base metals. Tests over known mineralised areas in west, north-west and north-east Tasmania have successfully outlined anomalies formerly indicated only by 'C' horizon or bedrock sampling.

Preliminary studies of the water application of the system are yielding encouraging results. Further development of sampling techniques and sample processing will be required before this part of the system is a viable exploration technique. Minor activities of the section have included the development of spot testing and staining techniques to support petrological studies. A limited environmental study involving pH and suspended solids control in alluvial minerals prospecting was also undertaken.

GEOLOGICAL SUPPORT SERVICES

FIELD ASSISTANCE

Groundwater programs were carried out in conjunction with the Engineering Geology Branch in the North West, Peninsula, and West Coast areas. Groundwater monitors

were installed in the Smithton and Burnie areas.

Well logging and bore hole surveys were carried out on a total of twelve holes, including some associated with the Mt Read program.

A total of 2677 gravity readings were taken by field assistants and added to the state grid; areas covered were Cethana, Balfour, northern Midlands, Burnie, Cuni and Boco Siding.

CARTOGRAPHIC DRAFTING

The following progress was made on colour map production.

1:50 000 Geological Atlas Series

Macquarie Harbour—drafted and printing

1:25 000 Mt Read Volcanics Project Geological Maps

Mt Cattley—Mt Tor—drafted and printed

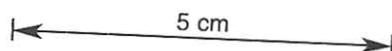
Back Peak—Cradle Mountain—drafted and printed

1:50 000 Metallic Mineral Deposit Maps

Elliott Bay—drafted and printed

Loongana—drafting commenced

In February a second computer-aided drafting system (CAD) was acquired. The use of the two work stations has proven to be of great benefit to the Department. During the





Cartographer John Clarke (left) and geologist Bert Moore confer over the production of a groundwater map of north-eastern Tasmania.

year approximately 220 diagrams for reports and bulletins were generated, and the majority of these were produced using CAD.

LIBRARY

The Librarian, Margaret Ellis, was on accouchment leave from September. The position was filled by Acting Librarian Bill Shepherd. In January the Library Assisant, Sandra Harris, commenced accouchment leave, her position being filled in late January by Christine Stubbs.

Collection

The book stock expanded, particularly in the fields of reference materials, ore geology and granite research. New journal subscriptions were taken in the fields of computing, geographical information systems, ore geology and soil conservation. A collection of Lands Department 1:25 000 scale topographic maps was commenced.

Reference and Information

During the year 516 items were borrowed by staff. Of the 1737 reference queries received by the library during the year, 1180 were readily answerable, while 557 required literature searches. There were 64 computer searches conducted during the year for both Departmental staff and outside users. The library had 700 outside users during the year.

Progress has continued with the in-house data bases compiled by Departmental staff. TASXPLOER has proven to be successful. Library staff can access open file company exploration reports by a wide range of fields. This service is available to clients for a modest fee. Progress is also being made on indexing for DOMINFO, the data base of Department of Mines reports, and PETXPLOER, the offshore oil exploration data base.

The Library continues to be the centre for the Exploration Tender Service, holding open-file reports in hard copy and microfiche. Fiche reports are proving reasonably popular, being normally immediately available for a modest fee.

Technical service

The Library has acquired personal computer hardware and the INMAGIC software system for use in maintaining library records.

Circulation of journals was reduced to avoid long delays. To compensate, contents and accessions lists were made regularly available.

In general, despite staff changes, the Library has continued to provide an outgoing progressive service, with good support from the Department staff.

PUBLICATIONS

Facilities for the production of reports and leaflets were significantly upgraded with the purchase of two desktop publishing systems in September. Typesetting for publications had previously been done by the Government Printer, using text input and coded in the Department and transferred to the printer via magnetic tape. The resultant typeset text then needed checking and correction before manual paste-up. All typesetting and layout is now done using the DTP system, with camera-ready copy being output on a laser printer. The elimination of the external typesetting stage and the manual paste-up has resulted in very significant time savings in report production, with a consequent increase in material produced. The DTP system can also accept input from the Cartographic Drafting Branch's computer-aided drafting system. This has allowed incorporation of most report drawings into the text using the computer, with a consequent saving in photographic processing time and photographic materials.

The following publications were printed during the year:

Report of the Director of Mines for 1987-88

Mines News Issue 23

1:50 000 Geological Survey Explanatory Reports:

Huntley, by A. V. Brown *et al.*

St Valentines, by D. B. Seymour *et al.*

Geological Survey Bulletins:

63—Landslides and land-use planning, by A. L. Telfer

66—The granites of west and north-west Tasmania—a geophysical interpretation, by D. E. Leaman and R. G. Richardson

Several new or updated leaflets were issued, including:

Exploration and Mining on Private Land—Issues for Public Discussion

Notes on Procedures for Occupation of Land for Mining Purposes (12th Edition)

Exploration Licences—General Conditions

Exploration and Mining—The Landholders Position

Publications in press at year end included explanatory notes for the Interlaken and

Smithton 1:50 000 geological maps, and Bulletin 65 (Stratigraphy, sedimentology and structural setting of the Cambrian Sticht Range Formation, western Tasmania).

Mt Read Volcanics Project

The first report in the MRVP Geological Report series, "The Geology of the Hellyer-Mt Charter area", was in press at the end of the year, with Report 2 (Geology of the Tullah-Mt Block area) almost ready for the printer.

The following consultants reports were issued:

MANTLE88—Regional gravity field, Tasmania, by D. E. Leaman.

Geophysical signatures of western Tasmania. Volume 1. Signatures of mineral deposits, by J. R. Bishop and R. J. G. Lewis.

Geophysical signatures of western Tasmania. Volume 2. Electrical properties of western Tasmanian materials, by J. R. Bishop and R. J. G. Lewis.

Mineral Resources of Tasmania

Further reports are to be issued in the former Geological Survey Mineral Resources series of publications. A pamphlet on alluvial gold was issued during the year, while a report on the silica resources of Tasmania is in press.

Reports

The Department has issued reports in the formal "Unpublished Report" series since 1971. These reports have covered a wide range of subjects, and have included some lengthy and detailed work. The majority of reports issued were collated and printed in the annual "Technical Report" until this series was discontinued in 1975. The use of the title "Unpublished Report" is now considered inappropriate, and was discontinued in June in favour of "Report". The list of Unpublished Reports issued during the year is given in Table 3.

Consultants Reports

Three reports on work done by the Department on a consultancy basis were issued during the year. These reports covered the geology of the Tullabardine Valley, the bedrock geology of the Teepookana dam site, and petrological and oxygen isotope investigation of altered rocks in the Cattley Range area.

Table 3

LIST OF UNPUBLISHED REPORTS 1988-89

No.	Title	Author	Date
1987/10	Geology, stratigraphy and petrography of the Mt Lloyd coalfield.	S. M. Forsyth & C. A. Bacon	22. 3.89
1987/48	Slope stability investigation at 9 Orana Place, Riverside.	D. J. Sloane	16. 6.89
1988/03	Industrial minerals in Tasmania—silica.	C. A. Bacon	19. 7.88
1988/12	Final report on the geological mapping and soil auger drilling of the Meander Irrigation Channel.	P. C. Stevenson	25. 7.88
1988/20	SAMPROP—A data base for basic physical property data from samples and drill core.	R. G. Richardson	5. 7.88
1988/21	Investigation of a cracked house in Windermere Road, East Tamar.	W. R. Moore	6. 7.88
1988/22	Field manual for the Toshiba laptop computer.	R. J. Sedgman & B. D. Weldon	18. 7.88
1988/23	Industrial minerals in Tasmania—Salt.	C. A. Bacon	11. 7.88
1988/24	Comments on the investigation of cracked buildings at the TSIT campus at Newnham.	W. R. Moore	20. 7.88
1988/25	Petrography of basalt from Brambles Quarry, Ridgely.	R. S. Bottrill	2. 9.88
1988/26	Unidata installation at S. Pickett's house, Windermere Road, Windermere.	R. J. Sedgman	14. 9.88
1988/27	Garnet-pyroxene-plagioclase granulite xenoliths from lamprophyre dyke, south-east King Island.	H. M. Waldron & A. V. Brown	27.10.88
1988/28	CARP—Computer-assisted retrieval of plans (Revision 3).	R. G. Richardson	14. 9.88
1988/29	Industrial minerals in Tasmania—wollastonite.	C. A. Bacon & R. S. Bottrill	14.10.88
1988/30	Searching techniques for CARP (Computer-assisted retrieval of plans).	J. S. Ladaniwskyj & G. J. Dickens	3.10.88
1988/31	TASROK—a computer-based catalogue for Tasmanian rocks (Revision 2).	R. G. Richardson	27.10.88
1988/32	Field manual for the Unidata 6003 portable logger. Revision 1 for use with version 1.8 software.	R. J. Sedgman	7.12.88
1988/33	The grainsize and associations of gold from the Henty Prospect.	R. S. Bottrill	8.12.88
1988/34	Mineralogy of shore sediment and seawater-suspended material from Hawley Beach.	R. S. Bottrill	6.12.88
1988/35	A literature review relating to groundwater conditions at the Beaconsfield Gold Mine.	B. D. Weldon	22.12.88
1989/01	Unidata installation on a landslip at Taroona.	R. J. Sedgman	3.03.89
1989/02	The gold content of gravels at the King River dam site.	R. S. Bottrill	30.06.89
1989/03	Proposed lithostratigraphic classification for Tasmanian rock specimens in Departmental collections.	R. S. Bottrill & E. Williams	10.04.89
1989/04	WIRELOG—Fortran programs for replaying, archiving and retrieving wireline logging data.	R. G. Richardson	9.05.89
1989/05	Geophysical surveys at Boco Siding.	R. G. Richardson	7.06.89
1989/06	Slope stability and engineering geology of the Blackstone Heights area—Compilation report.	W. R. Moore	14.03.89
1989/07	A guide to the Department of Mines publications (DOMINFO) data sheet.	P. K. Wrigley	23.02.89
1989/08	Investigation of possible extensions to the HBMI quarry at Leslie Vale.	W. L. Matthews	2.05.89
1989/09	One hundred years of the Department of Mines—The Heads of Department.	C. A. Bacon	12.05.89
1989/10	Basaltic agglomerate from near Weldborough.	R. S. Bottrill	29.03.89
1989/11	Industrial minerals in Tasmania—Granite and marble.	C. A. Bacon	9.05.89
1989/12	Unidata installation at E. T. Aspinall's house, Windermere Road, Windermere.	R. J. Sedgman	26.06.89
1989/13	Unidata installation at Ambrose's house, Droughty Point Road, Rokeby.	R. J. Sedgman	26.06.89
1989/14	The Edith Creek gold prospect.	R. S. Bottrill	12.05.89
1989/15	Operations report—1988/89 helicopter gravity survey.	R. G. Richardson	2.05.89
1989/16	Palygorskite from Edith Creek.	R. S. Bottrill	7.06.89
1989/18	Tectonic transport of rock-units near Asbestos Point, Macquarie Harbour.	M. P. McClenaghan & E. Williams	10.05.89
1989/19	The Mangana-Alberton aeromagnetic survey—A preliminary interpretation.	R. G. Richardson	7.06.89
1989/24	Seismic survey in the Chigwell area.	W. L. Matthews	22.06.89
1989/25	Seismic survey in the Proctors Road area.	W. L. Matthews	23.06.89

CHEMICAL AND METALLURGICAL DIVISION

The past year has seen a continuation of the escalating levels of activity within the Division, particularly in the number of determinations made by the Chemical Branch.

The Division's responsibility for supplying an effective analytical and metallurgical service to Government, industry, and the public has been more than adequately fulfilled.

A policy of actively promoting to private industry the range of services and facilities available has shown positive results, with an increase in the number of samples registered from 4953 in 1987-88 to 8470 in the year being reviewed. This represents an increase of 71%, much of it coming from mining and exploration companies operating within the State. Most of this work was previously sent interstate, and it is pleasing to note that the quality of service offered is attracting more clients from the public arena to use this laboratory. This should continue into the years ahead.

A total of 76 individual companies and organisations used the laboratory services during the year, compared with 47 in 1987-88. In addition to this, service was provided by way of chemical analyses, examinations, identifications etc. to numerous private individuals.

Issues of Miners' Rights and Prospecting Licences continued to be a significant part of business conducted from this office. Frequent enquiries concerning Mining Leases and Tamar Valley landslip zones were dealt with, as were a large number of counter and telephone enquiries on a diverse array of topics.

INCOME

The total income actual and notional generated from the laboratory activities and the general office for 1988-89 amounted to \$201 672.

This was made up as follows:

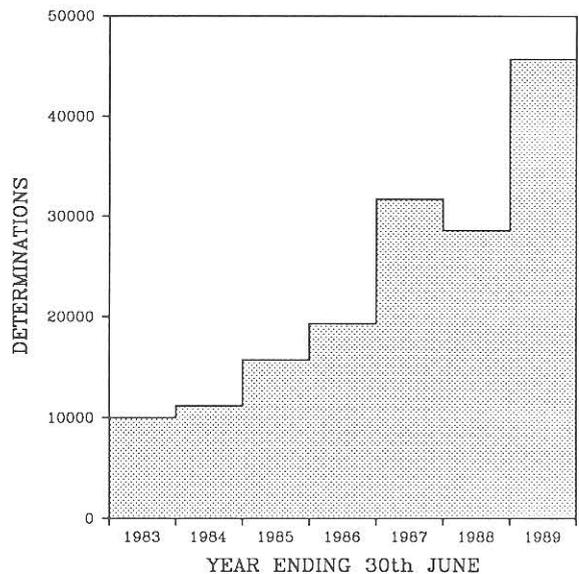
- Laboratory fees invoiced to outside clients, including metallurgical work, totalled \$130 292. This is an increase of 70% over the previous year.
- Value of Laboratory work done for Geological Survey and other divisions totalled \$43 428.

- Value of work done for other Agencies and Local Government Authorities totalled \$3 125.
- Miscellaneous Account. This comprises income from sale of Prospectors Licences, Miners Rights, Geological Survey maps and Magazine fees etc, and totalled \$24 827.

LABORATORY PERFORMANCE

At the end of year 1988-89, the conclusion of a successful and productive year, it is timely to review the laboratories comparative performance over a number of years.

The histogram below clearly shows the improvement in productivity which has been achieved over the last several years. There is the capacity and potential for much further improvement in the years ahead.



CHEMICAL BRANCH

Once again a considerable volume of the years work was done for the Geological Survey Division of the Department. The major part of this was accounted for by whole-rock analyses plus trace elements for rock characterisation. Analyses of bore and other waters for our geologists also represented a significant volume of work.

Analytical work done for other Government Agencies and Local Government Authorities was a relatively minor amount, but important and necessary.

The total number of determinations was at an all time record of 44 615. This represents an increase over last year of 74 per cent.

As predicted in last years report there has been a massive increase in the number of gold assays done, i.e. 2718 as against 1005, an increase of 170 per cent. There have been similar increases in base metal determinations i.e. copper, lead, zinc, arsenic, antimony, iron, etc., reflecting the laboratory's increasing involvement with the exploration arm of the mining industry.

Silver determinations have shown a spectacular 1000% increase, this being the result of analyses of base metal sulphide exploration samples plus an Australia-wide involvement with analyses relating to recovery of silver from photographic waste products.

Tin assays have almost trebled over those done last year. This is the result of an ongoing involvement with metallurgical test work and exploration samples from the recently established Anchor Mine at Blue Tier.

Tungsten assays have remained relatively stable (1578/1376). Most of the tungsten assaying stems from the day-to-day monitoring of Tasmania Mines Kara Mill, plus a continuing metallurgical consulting role with that Company.

The analysis of environmental and bore waters again represented a considerable proportion of the years work. Sample numbers and numbers of determinations were essentially similar to those of last year.

METALLURGICAL BRANCH

Metallurgical activity superficially appears to have suffered a decline. However this is not quite the whole picture, as last years figures were enhanced by a large number of heavy liquid separations which also required prescreening, both operations appearing in the metallurgical statistics.

The number of small metallurgical tests undertaken, apart from Research Projects, was 780 , which was 22% higher than 1986-87.

The branch continued to be active generally in three main areas, namely:

- The small scale "one-off" tests mentioned above.

- Research Investigations on ores and metallurgical products, and
- Visits to operating plants in a consultancy role to review, sample or otherwise assess performance, and advise on means of optimising or improving such performance.

It is important to note also that the Metallurgical Branch is responsible for the preparation, drying, crushing, grinding, riffing etc. of all solid samples submitted. This year has seen a very marked increase in that activity.

A feature of metallurgical business conducted was the frequent usage of laboratory facilities by metallurgists employed by mining companies to conduct research and test work for their particular programmes. A suitable fee was levied for all such work, and the analyses of products generated were done by our Chemical Branch.

Several items of metallurgical equipment were hired out to various companies to conduct on-site experimental work. The companies involved were responsible for the good care and maintenance of such equipment.

The companies are very conscious of the value to them of such arrangements. It is of mutual advantage for such arrangements to take place, as we can thus satisfy company requirements for test work and at the same time, our occasional shortfall in staffing does not become a problem.

NATA

The laboratory continues to be registered with the National Association of Testing Authorities.

The laboratory took part in two proficiency tests during the year, gold assaying and water analysis. Some thirty laboratories were involved in these programs. Our results were all very close to the consensus mean values.

Gold results were exceptionally good, being within ± 1 standard deviation for all samples assayed.

NEW EQUIPMENT

A new grinding machine has been installed. Its purpose is to enable very fine grinding of relatively large gold samples thus ensuring, as far as possible, an even distribution of

values in assay samples, counteracting erratic results caused by "spotty" gold.

A microwave digesting system has been put into service. This enables a rapid dissolution of refractory materials to take place. Digestion times can be reduced by several hundred percent in some cases.

INSTRUMENT GAS RETICULATION

The gas bottle cages external to the laboratory building have been extended to house oxygen and nitrogen gas cylinders. A gas reticulation system has been installed to deliver nitrogen to the two AAS instruments, and nitrogen and oxygen to the LECO furnace.

This reticulation system supplements the acetylene reticulation, and replaces the previous clumsy and inefficient practice of manually carrying gas bottles into the building to stand free beside the various instrument stations.

X-RAY FLUORESCENCE SPECTROMETER

Maintenance of this instrument is now done by the laboratory staff, which has effected a savings of several thousand dollars per year previously spent on outside technicians.

A carousel sample-changing arrangement, designed and installed by Departmental technician Rohan Sedgman, has been added to the instrument. As a result the instrument can now operate for up to 36 hours on long programmes without attention. Output in general has improved greatly.

STAFF TRAINING AND DEVELOPMENT

A number of seminars, workshops and conferences relating to laboratory activities have been attended by staff. The importance of this cannot be over-emphasised, as all professional staff need to keep pace with advances in technology to properly perform their duties.

A particular feature of this aspect of activity was the attendance by four laboratory staff at a Department of Mines 'in house' seminar held at Swansea. This was extremely useful in informing people in various Divisions of their roles in the whole of a complex organisation.

OCCUPATIONAL HEALTH AND SAFETY

An occupational health and safety committee was formed during the year. Its function is obvious and it will be very beneficial.

A survey of dust, fume and noise was conducted. Total and respirable dust concentrations were below exposure threshold levels, as was lead fume in the fire assay area. Sound pressure levels were below prescribed daily noise dose levels. Approved respirators and hearing conservation equipment have been supplied to staff working in areas where noise, dust and fume can occur. Two staff members were tested for lead levels in blood. No abnormalities were detected.

CONCLUSION

The Division has had a remarkably successful year. A high quality service has been provided to the Geological Survey and other Divisions of the Department.

The policy of maintaining and enhancing contact with private industry has resulted in an increased demand for the laboratory services as shown by the dramatic increase in the number of samples registered and determinations completed. Improvements in the laboratory layout and provision of extra grinding and analytical equipment has helped to make this possible.

A better balanced work force also contributed to increased productivity. Notwithstanding any of the above, an organisation is only as good as the people who operate it, and all laboratory staff are to be congratulated on their application and efficiency in achieving the excellent results of the year 1988-89.

TYPE OF SAMPLE RECEIVED

<i>Type</i>	<i>Number</i>	
	<i>1987-88</i>	<i>1988-89</i>
Water	1732	1790
Industrial liquor	52	33
Metal/alloy	10	63
Metallurgical product	1825	2476
Rock or mineral	1334	3746
Samples in progress	-	362
Total	4953	8470

TYPE OF ANALYTICAL METHOD USED

Type	Number	
	1987-88	1988-89
Atomic absorption (AAS)	6 769	19 182
X-Ray fluorescence (XRF)	10 788	15 121
Fire assay	793	2 771
Miscellaneous	7 285	7 541
Total	25 635	44 615

TYPE AND NUMBER OF TESTS

Type	Number	
	1987-88	1988-89
Quantitative	25 593	44 559
Qualitative	42	56
Metallurgical	2440	780
Total	28 075	45 395

Note: Determination of individual elements, radicals etc. are shown in Table 20.

RESEARCH INVESTIGATIONS (PUBLISHED OR IN PROGRESS)

Type	Number
Magnetite	2
Gold	1
Silicon/slag	1
Silica	1
Andalusite	1
Corrosion	1
Magnesite	1
Tin	1
Tungsten	2
Total	11

SUMMARY OF INVESTIGATIONS**GOLD****R876—Director of Mines, Hellyer sulphide tailing**

Work is proceeding intermittently on this project as time becomes available. A preliminary report has been compiled and gold extraction results from grinding, roasting and cyanidation are not encouraging.

Further test work, using a different approach, is planned for next year.

MAGNETITE**R893—Tasmania Mines, penalty elements in magnetite concentrate**

The Company is selling magnetite to BHP for steel making. Zinc, aluminium and silicon in the concentrate are subject to penalty, and the purpose of the test work was to define a method of reducing these elements.

Grinding to minus 600 μm followed by magnetic separation reduce these elements, increased the iron content, and released some 26% of the composite scheelite which could be returned to the scheelite mill.

R898—Tasmania Mines, fine slime in magnetite

This investigation is being done to determine the required hydraulic cyclone geometry to discard ultra-fine earthy slime from concentrate in case the Company has a need to do this as a sales requirement.

SILICA**R895—MK Silica, plant inspection**

An inspection and appraisal was made of the MK Silica Plant at Heybridge. Subsequent to this a number of sizing analyses were done on plant products.

SILICON/SLAG**R894—South Pole Metals**

A separation of silicon metal from slag, products from the Pioneer Silicon works, was required. Jigging results were not good, but results of heavy liquid separation were encouraging.

Assaying difficulties are delaying completion of the project.

CORROSION**R897—Tonganah Clay**

The plant was examined with a view to identifying causes of corrosion and means of minimising it. Corrosion was particularly apparent about the drum filter (feed water pH 3.2, 1074 ppm SO_4). Clay brightness (colour) could be affected adversely by dissolved iron.

The Company has been advised of probable causes and remedial action was suggested.

ANDALUSITE

R896—Otter Exploration, andalusite ore

Experimental work was confined to crushing, grinding, screening and heavy liquid separations. Results were not encouraging.

TIN

R888—Spectrum Resources, Anchor Mine

Test work and feasibility studies were completed and the report issued early in the year. The plant has now been commissioned and it is expected that performance will be monitored by periodic sampling and assaying.

MAGNESITE

R900—Mineral Holdings

The possibility of selected fracturing of macro and micro crystalline varieties by heating was investigated. A range of temperatures was investigated but little or no beneficiation by sizing was obtained after heating.

ZIRCON/ANDALUSITE

R899—RS Mines Ltd, Newcastle, imported zircon concentrate

An impure concentrate containing zircon, rutile, andalusite and other associated heavy minerals was received. A program of test work involving screening, magnetic separation and table concentration resulted in recovery of 98.8% of the zircon in a concentrate containing 48.2% ZrO₂ and 8.3% TiO₂ as rutile, with 34% rejection of mass.

Experiments to effect separations by froth flotation were not successful.

TUNGSTEN

R870—Tasmania Mines, consultancy

This project entails an ongoing consultancy role with the metallurgical operations of this Company at its Kara Mill.

R889—Tasmania Mines, sulphide removal from concentrate

The present state of this investigation is that an experimental plant has been set up at the mine site. As time permits field trials to establish operating conditions are taking place.

STATISTICAL TABLES

Table 4

EMPLOYMENT AND ACCIDENT STATISTICS 1988-89
(IN ACCORDANCE WITH AUSTRALIAN STANDARD AS1885)

<i>Employer</i>	<i>Work Hours Exposure</i>	<i>No. of Injuries</i>	<i>Days Lost</i>	<i>No. of Emp.</i>	<i>Frequency Rate</i>	<i>Incidence Rate</i>	<i>Mean Duration</i>
Aberfoyle—Hellyer	569 204	29	428	255	51	11	14.8
Aberfoyle—Que River . . .	180 684	12	253	102	66	12	21.1
Anchor Mine	14 040	1	2	11	71	9	2.0
APPM Tonganah	32 553	4	50	19	123	21	12.5
Beaconsfield	50 370	7	39	24	139	29	5.6
King Island Scheelite . .	194 611	12	39	101	62	12	3.3
Mount Lyell	1 132 475	157	1 855	561	139	28	11.8
Pasminco Rosebery . . .	976 674	189	3 028	513	194	37	16.0
Renison	858 161	111	1 538	422	129	26	13.9
Savage River	780 603	77	1 362	385	99	20	17.7
Tasmania Mines	61 672	6	27	26	97	23	4.5
All Mines	4 851 047	605	8 621	2 419	125	25	14.2
Comalco	2 479 306	90	980	1 212	36	7	10.9
Goliath Cement	413 447	24	328	228	58	11	13.7
Mole Creek	40 617	3	57	22	74	14	19.0
MK Silica	17 415	3	29	8	172	38	9.7
Pasminco Risdon	2 878 847	398	5 017	1 500	138	27	12.6
Pioneer Silicon	126 463	24	309	70	190	34	12.9
Port Latta	338 476	14	62	167	41	8	4.4
Temco	825 351	89	871	426	108	21	9.8
Tioxide Aust.	1 059 452	22	410	553	21	4	18.6
Ceramics	176 599	27	557	91	153	30	20.6
All Works	8 355 973	694	8 620	4 277	83	16	12.4
Collieries	226 172	49	589	134	217	37	12.0
Quarries	195 202	10	165	97	51	10	16.5
TOTALS	13 628 394	1 358	17 995	6 927	100	20	13.3

DEFINITIONS

FREQUENCY RATE

This is the number of lost-time injuries in the year, related to a million work-hour unit, as follows:

Lost time injury frequency rate = Number of lost-time injuries × 1 000 000 / Work-hours exposure

INCIDENCE RATE

This is the number of lost-time injuries × 100/Number of employees

MEAN DURATION RATE

This is the time lost per lost-time injury, as follows:

Mean Duration = Days lost (shifts) / Number of lost-time injuries

Accidents of 1-3 working days lost time = 35% of accidents

Accidents of 4-10 working days lost time = 37% of accidents

Accidents of over 10 working days lost time = 28% of accidents

Table 5

CERTIFICATES OF COMPETENCY

The following Certificates of Competency were issued by the Board of Examiners in accordance with the Mines Inspection Act 1968:

MINE MANAGERS CERTIFICATES

<i>Certificate Number</i>	<i>Name</i>	<i>Date</i>	<i>Mine</i>
<i>Metalliferous</i>			
314/88	Lindsay George Reed	1. 7.88	Mt Lyell
315/88	Anthony John Weston	9. 8.88	Hellyer
316/88	Stephen Anthony Hunnam	16. 8.88	King Island Scheelite
317/88	Glenn Robert Jardine	16. 8.88	Renison
318/88	Francis William Lannen	24. 8.88	Hellyer
319/89	Michael Ronald Thomas Higgins	7. 2.89	Pasminco Rosebery
320/89	Andrew Ernest Lovell	7. 2.89	Renison
321/89	Thomas Harry Bagan	7. 2.89	Renison
322/89	Gregory George Marshall	30. 3.89	Que River
323/89	Gregory John Kennewell	16. 5.89	Renison
324/89	Andrew Douglas Shaw	16. 5.89	Hellyer

Certificates were issued following written examinations in legal knowledge and examination *viva voce*.

In addition 51 crane drivers', two winder drivers', and one engine drivers' Certificates of Competency were issued.

Table 6
MINERAL PRODUCTION FOR THE YEAR 1988–1989 FROM TASMANIAN SOURCES

	<i>Golconda</i>	<i>Cornwall Coal Co.</i>	<i>Pasminco Metals (1)</i>	<i>King Is. Scheelite</i>	<i>Mt Lyell</i>	<i>Hellyer</i>	<i>Renison Ltd</i>	<i>Savage Riv. Mines</i>	<i>Pioneer Silicon Ind.</i>	<i>Tasmania Mines</i>	<i>Small Producers</i>
Cadmium (tonnes)	125	...	...	...	...	...	...	...	...
Cobalt oxide (tonnes)	1.6	...	...	...	...	...	...	...	...
Copper (tonnes)	3 605	...	18 678	3	...	...	...	...	...
Gold (kg)	–	...	1 534	...	435	...	...	...	...	...	3.64
Iron ore pellets (tonnes)	2 295 321	...	...	...
Lead (tonnes)	32 114	...	...	13 535	...	...	...	...	...
Manganese dioxide . . . (tonnes)	135	...	...	...	...	...	...	...	...
Molybdenum (tonnes)	11.23	...	...	...	...	...	...	...
Silicon (tonnes)	8 024	...	...	...
Silver (kg)	92 103	...	2 888	25 048	...	...	...	...	0.11
Sulphuric acid . . (mono tonnes)	66 441	...	...	...	...	...	...	...	...
Tin (tonnes)	6 815	...	...	...	6
Tungsten (tonnes)	1 376	...	...	...	...	...	382	5
Zinc (tonnes)	139 042	...	...	27 560	...	...	...	...	...
Coal (tonnes)	...	632 070	...	...	...	...	...	...	...	...	305
Peat (m ³)	3 205

(1) Includes production from Que River Mines

Table 7

VALUE OF THE MINERAL INDUSTRY

Year ended Commodity	Unit	30 June 1988 Total Quantity	30 June 1989 Total Quantity
METALLIC MINERALS			
Cadmium	(tonne)	138	125
Cobalt oxide	(tonne)	3.6	1.6
Copper	(tonne)	25 636	22 286
Crocoite	(kilogram)	-	1 350
Gold	(kilogram)	2 260	1 972
Iron ore pellets	(tonne)	2 260 068	2 295 321
Iron oxide	(tonne)	27 985	200 354
Lead	(tonne)	42 267	45 649
Manganese dioxide	(tonne)	120	135
Molybdenum	(tonne)	10	11
Osmiridium	(kilogram)	-	0.1
Pyrite	(tonne)	64 453	41 390
Silica for silicon alloy	(tonne)	78 824	149 928
Silicon (metallic or as alloy)	(tonne)	7 528	8 024
Silver	(kilogram)	120 723	120 039
Sulphuric acid	(mono tonne)	86 821	66 441
Tin	(tonne)	6 226	6 821
Tungsten as tungstic oxide	(tonne)	1 478	1 764
Zinc	(tonne)	101 226	166 602
Value of metallic minerals		\$460 466 752	\$533 274 264
NON-METALLIC AND FUEL MINERALS			
Clay-			
Brick	(tonne)	37 022	71 242
Other	(tonne)	53 184	61 916
Kaolin	(tonne)	7 643	30 227
Dolomite	(tonne)	11 714	37 878
Limestone-			
Agricultural	(tonne)	55 282	78 113
Cement	(tonne)	593 204	687 045
Chemical and metallurgical	(tonne)	102 404	100 684
Other	(tonne)	39 886	54 583
Pebbles	(tonne)	-	-
Coal (run of mine)	(tonne)	608 700	632 375
Peat	(m ³)	5 979	3 205
Value of non-metallic and fuel minerals		\$26 874 142	\$30 639 949
CONSTRUCTION MATERIALS			
Building stone-			
Freestone	(tonne)	226	155
Granite	(tonne)	925	163
Other	(tonne)	2 083	688
Crushed and broken stone-			
Basalt	(tonne)	807 674	1 104 434
Dolerite	(tonne)	575 922	1 177 758
Limestone	(tonne)	15 856	77 139
Sandstone	(tonne)	174	5 568
Other	(tonne)	71 144	160 013
Gravel	(tonne)	167 623	106 915
Sand	(tonne)	433 091	518 102
Other road materials	(tonne)	509 106	1 312 965
Value of construction materials		\$17 526 959	\$24 335 795
TOTAL VALUE WITH AUSTRALIAN METAL PRICES		\$504 867 853	\$588 250 008
METALLURGICAL PRODUCTION FROM OTHER THAN TASMANIAN ORES			
Aluminium	(tonne)		
Aluminium sulphate	(tonne)		
Cadmium	(tonne)		
Cobalt oxide	(tonne)		
Ferro-manganese	(tonne)		
Ferro-silicon	(tonne)	\$655 130 838	\$818 298 264
Silico-manganese	(tonne)		
Sinter	(tonne)		
Superphosphate	(tonne)		
Titanium dioxide	(tonne)		
Zinc	(tonne)		
VALUE OF MINING AND METALLURGICAL PRODUCTION		\$1 159 998 691	\$1 406 548 272
REPORTED AVERAGE NUMBER OF EMPLOYEES (1)		6 689	7 770

(1) Not all operators report full details

Table 8

MINERAL PRODUCTION FROM TASMANIAN SOURCES SINCE 1880
QUANTITY OF PRODUCTION AS AT 30 JUNE 1989

<i>Commodity</i>	<i>Unit</i>	<i>Quantity in Current Year</i>	<i>Total Quantity</i>
METALLIC MINERALS			
Antimony	(tonne)	-	3
Bismuth	(kilogram)	-	110 080
Cadmium	(tonne)	125	4 427
Chromite	(tonne)	-	2 687
Cobalt oxide	(tonne)	1.6	164.3
Copper (blister) to 1918 (now shown under Silver and Copper)	(tonne)	-	169 273
Copper matte	(tonne)	-	6 326
Copper ore to 1918 (now shown under Copper)	(tonne)	-	42 439
Copper (from 1919)	(tonne)	22 286	1 005 316
Crocoite	(kilogram)	1 350	1 350
Gold	(kilogram)	1 972	118 769
Ilmenite	(tonne)	-	558
Iron ore pellets	(tonne)	2 295 321	45 195 008
Iron oxide (including hematite, limonite and magnetite) ..	(tonne)	200 354	574 565
Lead (from 1919)	(tonne)	45 649	808 079
Manganese	(tonne)	-	1
Manganese dioxide (from 1957)	(tonne)	135	13 521
Mercury	(kilogram)	-	7 697
Molybdenum	(tonne)	11	147
Monazite	(tonne)	-	34
Nickel	(tonne)	-	237
Osmiridium	(kilogram)	0.1	0.1
Pyrite (to 1971)	(tonne)	-	2 124 070
Pyrite (from 1972)	(tonne)	41 390	1 566 365
Rutile	(tonne)	-	1
Rutile (concentrates)	(tonne)	-	40 027
Scheelite (concentrates)	(tonne)	-	57 261
Silica for silicon alloy production	(tonne)	149 928	704 936
Silicon	(tonne)	8 024	15 552
Silver-lead ore to 1918 (now shown under Silver and Lead)	(tonne)	-	1 101 295
Silver (from 1919)	(kilogram)	120 039	2 986 862
Sulphuric acid	(mono tonne)	66 441	5 082 292
Tin	(tonne)	6 821	281 912
Tungsten (as tungstic oxide)	(tonne)	1 764	32 443
Zinc	(tonne)	166 601	2 237 949
Zinc sulphate (from 1957)	(tonne)	-	4 306
Zircon (concentrates)	(tonne)	-	39 001
NON-METALLIC MINERALS			
Asbestos	(tonne)	-	4 044
Barite	(tonne)	-	2 240
Clay (from 1958)	(tonne)	133 158	4 035 946
Dolomite	(tonne)	37 878	274 147
Graphite	(tonne)	-	41
Kaolin	(tonne)	30 227	368 269
Limestone-			
Agricultural and other	(tonne)	132 696	2 164 741
Carbide	(tonne)	-	1 081 509
Cement	(tonne)	687 045	16 332 299
Chemical and metallurgical	(tonne)	100 684	6 036 412
Ochre	(tonne)	-	2 949
Pebbles (from 1957)	(tonne)	-	31 757
Sand (moulding)	(tonne)	-	864
Silica	(tonne)	80	701 248
Talc	(tonne)	-	338

Table 8

MINERAL PRODUCTION FROM TASMANIAN SOURCES SINCE 1880
 QUANTITY OF PRODUCTION AS AT 30 JUNE 1989 (continued)

<i>Commodity</i>	<i>Unit</i>	<i>Quantity in Current Year</i>	<i>Total Quantity</i>
FUEL MINERALS			
Coal (run of mine)	(tonne)	632 375	16 200 853
Shale	(tonne)	-	42 239
Peat	(m ³)	3 205	22 560
CONSTRUCTION MATERIALS			
Building stone-			
Freestone	(tonne)	155	28 938
Granite	(tonne)	163	131 836
Other stone	(tonne)	688	37 839
Crushed and broken stone (from 1958)-			
Basalt	(tonne)	1 104 434	14 769 569
Dolerite	(tonne)	1 177 758	26 629 462
Limestone	(tonne)	77 139	962 814
Sandstone	(tonne)	5 568	276 759
Other	(tonne)	160 013	10 654 232
Gravel (from 1958)	(tonne)	106 915	48 106 888
Sand (from 1958)	(tonne)	518 102	7 658 032
Other road-making material	(tonne)	1 312 965	8 682 934

Table 9

IMPORTED ORES

<i>Company</i>	<i>Product (tonnes)</i>				
	<i>Alumina</i>	<i>Lead-zinc concentrate</i>	<i>Ilmenite</i>	<i>Manganese ore</i>	<i>Phosphate rock</i>
Comalco (Bell Bay)	237 540	...	...	...	...
Pasminco Metals EZ .....	...	265 560	...	...	69 228
Tioxide Australia .....	...	...	72 074	...	...
TEMCO .....	...	...	...	352 516	...

Table 10

NUMBER AND AREA OF LEASES AND LICENCES APPLIED FOR
DURING THE YEAR TO 30 JUNE 1989

<i>Leases and Licences</i>	<i>Number</i>	<i>Area (ha)</i>	<i>Sluiceheads</i>
Coal	3	2 170	-
Gold	9	391	-
Gravel	19	233	-
Limestone.....	2	51	-
Minerals	15	6 588	-
Sand	11	202	-
Silica	3	223	-
Slate.....	1	20	-
Stone	16	398	-
Tin	13	878	-
Easements	1	6	-
Water	2	-	3
	95	11 160	3

Table 11

NUMBER AND AREA OF NEW LEASES AND LICENCES ISSUED
DURING THE YEAR TO 30 JUNE 1989

<i>Leases and Licences</i>	<i>Number</i>	<i>Area (ha)</i>	<i>Sluiceheads</i>
Clay.....	1	22	-
Copper	1	65	-
Gold	6	97	-
Granite.....	2	2	-
Gravel	13	222	-
Minerals	4	103	-
Osmiridium.....	2	7	-
Sand	7	221	-
Silica	7	381	-
Stone	17	143	-
Tin	3	121	-
Easements	-	-	-
Water	-	-	-
	63	1 384	-

Table 12

TOTAL NUMBER OF LEASES AND LICENCES IN FORCE
ON 30 JUNE 1989

<i>Leases and Licences</i>	<i>Number</i>	<i>Area (ha)</i>	<i>Sluiceheads</i>
Bauxite	1	53	-
Clay	14	307	-
Coal	21	6 666	-
Copper	4	1 195	-
Dolomite.....	2	131	-
Gold	78	5 918	-
Granite	7	140	-
Gravel	145	4 204	-
Iron	8	2 139	-
Limestone	15	1 281	-
Minerals	166	17 217	-
Osmiridium.....	2	7	-
Peat	5	772	-
Sand	81	3 804	-
Silica	32	2 083	-
Slate	4	137	-
Stone	207	16 032	-
Tin	210	11 100	-
Wolfram	4	70	-
Water	71	-	520
Easements	83	3 000	-
	1 160	76 256	520

Table 13TOTAL NUMBER OF ALL TYPES OF PROSPECTING RIGHTS HELD
AS AT 30 JUNE 1989

<i>Mining Tenement</i>	<i>Number</i>	<i>Area</i>
Exploration Licences.....	161	35 424 km ²
Retention Licences	28	596 km ²
Prospectors Licences	45	1 047 ha
Miners Rights	26	6.5 ha
Owners Rights	1	2 987 ha
Permits to explore for Petroleum under <i>Petroleum (Submerged Lands) Act 1967</i>	4	272 blocks

Table 14LICENCES, PERMITS AND APPROVALS ISSUED FOR THE IMPORT,
MANUFACTURE, STORAGE, USE AND SALE OF DANGEROUS
GOODS

Licences to keep flammable liquids and dangerous goods	2 484
Licences to sell explosives and safety cartridges	170
Private magazine licences	98
Import explosives licences	33
Convey explosives licences	19
Manufacture explosives licences	1
To sell fireworks licences	310
Applications for shotfirers permits	45
Applications for plan approvals	356
Landing permits	24
Transfers and information retrieval requests.....	111
Manufacture dangerous goods licences	7
Import dangerous goods licences	17
Gas suppliers licences	2
Exemptions	-

Table 15

IMPORTS OF FLAMMABLE LIQUIDS

<i>Product (tonnes)</i>	<i>Bell Bay</i>	<i>Burnie</i>	<i>Devonport</i>	<i>Hobart</i>	<i>Total</i>
Aviation gasoline	600	-	-	-	600
LP gas	8 673	-	16 700	8 830	34 203
Unleaded petrol	5 747	6 399	19 397	25 409	56 952
Super petrol	45 584	29 352	77 999	121 700	274 635
Kerosene-					
Aviation - Jet	11 230	-	-	15 507	26 737
Lighting and power	4 357	-	1 847	-	6 204
Bitumen feed stock	-	-	-	19 392	19 392
AGO and distillate	18 963	28 432	67 981	77 669	193 045
Heating and fuel oil	17 845	9 688	25 682	6 199	59 414
Total (tonnes) per port	112 999	73 871	209 606	274 706	671 182
Number of tankerships	30	12	36	27	105

Table 16

IMPORTS OF EXPLOSIVES AND EXPLOSIVE-GRADE AMMONIUM NITRATE

Product (cartons)	Burnie	King Is.	Q'town	Strahan	Hobart	Bell Bay	D'port	Total
Blasting Powder 1.1.D	-	-	-	-	-	-	-	-
Blasting Explosive 1.1.D	42 232	150	437	80	-	-	120	43 019
Detonating fuse 1.1.D	65	-	-	-	-	-	-	65
Propellant powder 1.1.C	-	-	-	-	25	168	-	193
Detonators 1.1.B	5 674	123	-	-	-	-	-	5 797
Ammonium Nitrate 5.1	-	-	-	-	-	-	-	-
Total (cartons)	47 971	273	437	80	25	168	120	49 074
Number of shipments	36	14	8	1	1	5	3	68

No explosives were imported through Wynyard or Smithton.

Table 17

ACTS ADMINISTERED BY DEPARTMENT OF MINES

Aid to Mining Act 1927
 Coastal and Other Waters (Application of State Laws) Act 1982
 Dangerous Goods Act 1976
 Department of Mines (Investigations) Act 1972
 Director of Mines Act 1951
 Gas Franchises Act 1973
 Groundwater Act 1985
 Iron Ore (Savage River) Agreement Act 1965
 Mineral Resources Act 1951
 Mines Inspection 1968
 Mining Acts 1929 and 1958
 Mount Cameron Water-Race Act 1926
 Mount Read and Rosebery Mines Limited Leases Act 1916
 Petroleum (Submerged Lands) Acts 1967, 1982

Table 18

STAFF EMPLOYMENT AS AT 30 JUNE 1989

Administration	28
Mines Inspection	20
Dangerous Goods	10
Geological Survey	45
Chemical & Metallurgical	15
R.D. and P.P.	16
Others	13
Total	147

Table 19

DRILLING DETAILS 1988-89

<i>Location</i>	<i>Purpose</i>	<i>Drill</i>	<i>No. of Holes</i>	<i>Total depth (m)</i>
DIAMOND DRILLING				
Currie, King Island	Harbour site	Longyear 38/2	10	98.4
Melba Flats	Stratigraphic investigation	Longyear 38/2	3	304.5
Kelso	Mineral investigation	Longyear 44/1	2	338.0
Mt Direction	Mineral investigation	Longyear 44/2	1	232.0
Guildford	Stratigraphic investigation	Longyear 44/1	1	313.4
Melba Flats	Stratigraphic investigation	Longyear 44/2	3	120.0
Yellow Marsh, Guildford	Sub-basalt investigation	Longyear 44/1	1	79.0
Midway Point	Road foundation	Longyear 44/2	5	67.1
Meander River	Damsite investigation	Longyear 44/2	4	124.6
Meander River	Damsite investigation	Longyear 38/2	4	115.5
Meander River	Damsite investigation	Longyear 44/1	12	418.6
Meander River	Quarry site	Longyear 44/1	1	35.4
Meander River/Huntsman Saddle	Site investigation	Longyear 38/2	6	211.0
Liberty Point/Macquarie Harbour	Stratigraphic investigation	Longyear 38/2	2	268.0
	Sub-Total			2 725.5
ROTARY/DOWN HOLE HAMMER DRILLING				
Mowbray	Tip site	Mayhew 1000	3	88.6
Legerwood	Water bore	Warman 1000	10	405.0
North Scottsdale	Water bore	Warman 1000	8	315.0
Ringarooma	Water bore	Warman 1000	4	232.0
Branxholm	Water bore	Warman 1000	1	8.0
Lebrina	Water bore	Warman 1000	4	202.0
Sheffield	Groundwater survey	Warman 1000	8	465.0
Sorell	Water bore	Warman 1000	3	100.0
Eaglehawk Neck	DMR site investigation	Warman 1000	3	72.7
Upper Castra	Groundwater survey	Warman 1000	1	96.0
	Sub-Total			1 984.3
DIAMOND/AUGER DRILLING				
Richmond	Site investigation	Gemco A	1	6.3
Eaglehawk Neck	DMR site	Gemco 210D	12	137.8
Bell Bay	Site investigation	Gemco 210D	9	178.3
Penguin-Howth	Road foundation	Gemco 210D	4	144.0
Salamanca Place	Site investigation	Gemco 210D	5	10.9
Bathurst Street, Hobart	Site investigation	Gemco 210D	9	62.4
Old Surrey Road, Burnie	Road foundation	Gemco 210D	20	451.3
Stanley	Harbour site	Gemco 210D	2	23.7
Hadspen	Bridge site	Gemco 210D	8	94.8
Glen Esk	Bridge site	Gemco 210D	7	43.0
	Sub-Total			1 152.5
CHURN DRILLING				
Beaconsfield	Installing casing	Keystone No.1	1	20.0
Seven Mile Beach	Groundwater investigation	Keystone No.1	9	169.0
Legerwood	Water bore	Keystone No.1	1	37.5
New River	Water bore	Keystone No.1	1	10.0
	Sub-Total			236.5
	Total			6 098.8

Table 20

TYPE AND NUMBER OF TESTS,
CHEMICAL AND METALLURGICAL DIVISION

I. QUANTITATIVE	
A. Elements	
Aluminium (Al)	187
Aluminium (Al ₂ O ₃)	314
Antimony	954
Arsenic	1 740
Barium	403
Bismuth	1 070
Cadmium	697
Calcium (Ca)	185
Calcium (CaO)	473
Carbon	-
Cerium	434
Chlorine	589
Chromium	471
Cobalt	358
Copper	2 889
Cyanide	-
Fluorine	659
Gallium	358
Gold	2 718
Indium	-
Iridium	1
Iron (Fe)	2 293
Iron (FeO)	219
Iron (Fe ₂ O ₃)	401
Lanthanum	358
Lead	3 271
Magnesium	185
Magnesium (MgO)	464
Manganese (MnO)	311
Manganese (Mn)	687
Mercury	576
Molybdenum	297
Neodymium	367
Nickel	398
Niobium	434
Nitrogen (as Ammonium)	261
Nitrogen (NO ₃)	13
Phosphorous (P)	77
Phosphorous (P ₂ O ₅)	324
Platinum	165
Potassium (K)	187
Potassium (K ₂ O)	278
Rubidium	413
Scandium	413
Selenium	-
Silicon (SiO ₂)	384
Silver	2 543
Sodium (Na)	187
Sodium (Na ₂ O)	273
Strontium	434
Sulphur (S)	351
Sulphur (as Sulphide)	92
Sulphur (SO ₃)	311
Sulphur (SO ₄)	832
Tantalum	32
Thallium	167
Thorium	434
Tin	881
Titanium (TiO ₂)	311
Tungsten	1 578
Uranium	434
Vanadium	434
Yttrium	434
Zinc	2 752
Zirconium	434

40 190

Table 20

TYPE AND NUMBER OF TESTS, CHEMICAL AND METALLURGICAL DIVISION — *continued*

B. Miscellaneous—Waters			
Conductivity	414		
Dissolved solids	458		
Suspended solids	668		
Turbidity	48		
pH	907		
Alkalinity	180		
Permanent hardness	180		
Temporary hardness	180		
Dissolved oxygen	48		
Carbonate	180		
Bicarbonate	180		
Hydroxyl ion	5		
Silica	54		
Combined oxygen demand	-	<u>3 502</u>	
C. Industrial Liquors			
pH	6		
Total solids	6		
Sodium Oxide	6		
Silica	6		
Viscosity	6		
Specific gravity	6		
Free Cyanide	2		
Total Cyanide	2		
Silver	25	<u>65</u>	
D. Other			
Combined water	196		
Loss on Ignition	377		
Ash (Coal)	1		
CO ₂	228	<u>802</u>	
II. QUALITATIVE		<u>56</u>	44 615
III. METALLURGICAL			
Sizing	82		
Magnetic Separation	40		
Panning	9		
Cyanidation	2		
Screening	219		
Jigging	22		
Tabling	24		
Gold Smelting	8		
Specific Gravity	7		
Flotation	6		
Roasting/Ashing	13		
Heavy Liquid Separation	189		
Compositing	3		
Cyclosizing	22		
Viscosity	1		
Settling tests	6		
Filtering	3		
Fine grinding	3		
Crushing	2		
Drying	112		
Fineness gold	6		
Amalgamation	1	<u>780</u>	
Total			45 395

FINANCIAL STATEMENT

SUMMARY OF EXPENDITURE FOR THE YEAR ENDED 30 JUNE 1989

	1986-87	1987-88	1988-89
	\$'000	\$'000	\$'000
CONSOLIDATED FUND—			
DIVISION 41—			
RECURRENT SERVICES—			
AGENCY RESOURCE SUMMARY—			
<i>Administration—</i>			
Salaries and payments related to salaries	778	841	746
Administrative expenses	262	280	336
Other expenditure	-	-	-
	1 040	1 121	1 082
<i>Mines Inspection—</i>			
Salaries and payments related to salaries	676	695	714
Administrative expenses	169	174	168
Other expenditure	213	207	83
	1 058	1 076	965
<i>Geological Survey—</i>			
Salaries and payments related to salaries	1 496	1 366	1 695
Administrative expenses	328	374	355
Other expenditure	77	103	89
	1 901	1 843	2 139
<i>Chemistry and Metallurgy—</i>			
Salaries and payments related to salaries	343	372	391
Administrative expenses	48	34	45
Other expenditure	31	28	33
	422	434	469
<i>Resource Development, Planning and Policy—</i>			
Salaries and payments related to salaries	219	236	460
Administrative expenses	30	29	56
Other expenditure*	*344	*350	*530
	593	615	1 046
<i>Petroleum Exploration—</i>			
Salaries and payments related to salaries	42	38	48
Administrative expenses	18	15	16
Other expenditure	-	-	-
	60	53	64
<i>Dangerous Goods Inspection—</i>			
Salaries and payments related to salaries	262	252	293
Administrative expenses	52	43	62
Other expenditure	-	-	-
	314	295	355
Total Consolidated Fund Expenditure	5 388	5 437	6 120
CONSOLIDATED FUND—			
WORKS AND SERVICES—			
<i>Agency Resource Summary—</i>			
Administration	17	1	9
Mines Inspection	129	93	244
Geological Survey	156	256	205
Chemistry and Metallurgical	33	114	126
Resource Development, Planning and Policy	-	9	4
Petroleum Resources	-	5	-
Dangerous Goods	-	13	7
Total Works and Services Expenditure	335	491	595
<i>Trust Fund—</i>			
In accordance with the provisions of the <i>Public Account Act</i>			
1957—			
National Soil Conservation Programme—			
Salaries and payments related to salaries	13	-	-
Other expenditure	1	-	-
	14	-	-

FINANCIAL STATEMENT

SUMMARY OF EXPENDITURE FOR THE YEAR ENDED 30 JUNE 1989—*continued*

	1986-87	1987-88	1988-89
	\$'000	\$'000	\$'000
<i>Deposit Account—</i>			
Deposits refunded	3	11	70
	3	11	70
<i>Gordon River Power Development—Mt Read Volcanics—</i>			
Salaries and payments	314	356	147
Other expenditure	504	204	333
	818	560	480
<i>Mining Trust Fund—</i>			
Aid to Mining Loans	35	-	27
	35	-	27
<i>Ringarooma and Cascade Water Suspense Account—</i>			
Interest on Loan	2	-	-
	2	-	-
<i>Forfeited Performance Deposits Account—</i>			
Restoration	-	3	5
	-	3	5
<i>Small Tin Miners Assistance Scheme—</i>			
Subsidy payments	6	4	2
	6	4	2
TOTAL TRUST FUND EXPENDITURE	878	578	584
TOTAL EXPENDITURE FROM ALL SOURCES	6 601	6 506	7 299

FINANCIAL STATEMENT

SUMMARY OF REVENUE FOR THE YEAR ENDED 30 JUNE 1989

	1986-87	1987-88	1988-89
	\$'000	\$'000	\$'000
CONSOLIDATED FUND—			
<i>Public works and services—</i>			
Drill hire	223	121	246
Survey fees	1	1	-
Geological services	50	59	75
	274	181	321
<i>Lease Rentals and Fees—</i>			
Lease Rents under the Mining Act	169	165	381
Fees under Petroleum (Submerged Lands) Act	3	6	140
Sale of maps and publications	18	14	29
Other fees under the Mining Act	277	302	545
	467	487	1 095
<i>Territorial Revenue—</i>			
Royalty on iron ore pellets	317	306	353
Sale of Government property	1	1	-
Storage of explosives and flammable liquids	100	124	177
<i>Mineral royalties—</i>			
Metallics	1 163	2 558	3 179
Sand and gravel	162	184	268
	1 743	3 173	3 977
<i>Other sources—</i>			
Miscellaneous	12	-	-
	12	-	-
Total Revenue from Consolidated Fund	2 496	3 841	5 393
<i>Consolidated Fund—Works and Services—</i>			
Repayments	31	-	8
Total Revenue from Works and Services	31	-	8
<i>Trust Fund—</i>			
Deposit Account	30	80	24
	30	80	24
<i>Mining Trust Fund—</i>			
Loan Repayments	22	19	12
	22	19	12
<i>Forfeited Performance Deposit Account—</i>			
Forfeited deposits	-	3	9
	-	3	9
TOTAL REVENUE FROM TRUST FUNDS	52	102	53
TOTAL REVENUE FROM ALL SOURCES	2 579	3 943	5 446

* Funds transferred to Gordon River Power Development Fund:

1986-87—\$344 000

1987-88—\$350 000

1988-89—\$480 000

REPORT OF THE MOUNT CAMERON WATER RACE BOARD FOR THE YEAR ENDED 30 JUNE 1989

The race continues to be fully utilised by Mr B. A. Farquhar for irrigation and stock purposes.

The opportunity was taken to have a meeting of the Board in Scottsdale, and for the members to inspect the utilisation of the race. The members were impressed by the work done on maintaining and extending the race, as well as the confirmation they received of the value of the decision to maintain its viability.

The Board also noted that maintenance and development costs to the value of some \$500 000 had been met from private investment without Government assistance.

M. R. Hargreaves, *Acting Chairman*
B. A. Farquhar, *Member*
T. J. Green, *Member*