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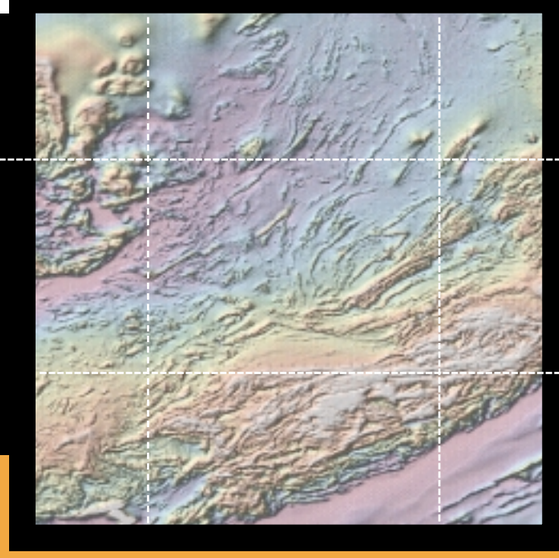
pmd*CRC

predictive mineral discovery
COOPERATIVE RESEARCH CENTRE



ANNUAL REPORT 2001–02

PURPOSE

The Purpose of the *predictive mineral discovery CRC* is *to generate a fundamental shift in exploration practice and cost-effectiveness* by developing a vastly improved understanding of mineralising processes and a four dimensional understanding of the evolution of the geology of mineralised terranes.

*pmd*CRC* VISION

"We will be a major influence in the rejuvenation of the mineral exploration industry and be the global leader in changing the science base for discovery of superior ore deposits ….. Our science and technology will be central to exploration programs world-wide …... Companies, students and researchers will clamour to be part of our centre and be part of creating new knowledge and technology that was not thought possible …… We will be the CRC that everyone talks about and a role model for best practice in project execution and delivery.

Investors will return to exploration as the growth investment of choice in the global mining industry, and Australian miners, explorers and service providers will lead the way."

Centre Objectives

Objective 1

Contribute to resolution of the key areas of uncertainty in current models for the formation of major economic mineral deposit types, within mineralised terranes having high exploration priority.

Objective 2

Build 3D and 4D images and histories of well known mineralised systems, within their regional exploration context.

Objective 3

Create a computational environment to simulate the 4D evolution of mineral systems with the goal of ranking and prioritising different exploration scenarios, and predicting location, and quality of ore deposits.

Objective 4

Create a commercial computational, visualisation and communications environment to allow companies to manage exploration and operational activities more efficiently.

Objective 5

Transfer these concepts, skills and technologies into the Australian mineral exploration industry, educational scene and investor/management environment to assure a long term competitive advantage to the industry.

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THE UNIVERSITY OF MELBOURNE

CSIRO

MONASH UNIVERSITY

GEOSCIENCE AUSTRALIA

JCU JAMES COOK UNIVERSITY

AMIRA INTERNATIONAL

LA TROBE UNIVERSITY

THE UNIVERSITY OF WESTERN AUSTRALIA

INTRODUCTION

The CRC for predictive mineral discovery

The ***pmd****CRC* was conceived by industry in partnership with the research community to focus research on issues that are of critical importance to ore discovery. There is considerable supporting data to demonstrate that over the past decade discovery of large high value deposits has dramatically declined in spite of the record levels of exploration expenditure over the same period.

The purpose of the ***pmd****CRC* is to focus on research that will contribute towards a fundamental shift in exploration practice and will therefore provide the means to target ore deposits faster and at lower costs than achieved through current practice.

Mineral exploration is expensive because most of the money is spent on finding and testing targets that will never be mines. A fundamental shift in exploration practice will result from identifying better quality targets (at a range of scales) and having fewer targets to test. Our role is to conduct research to improve our understanding of geological processes to target orebodies more effectively.

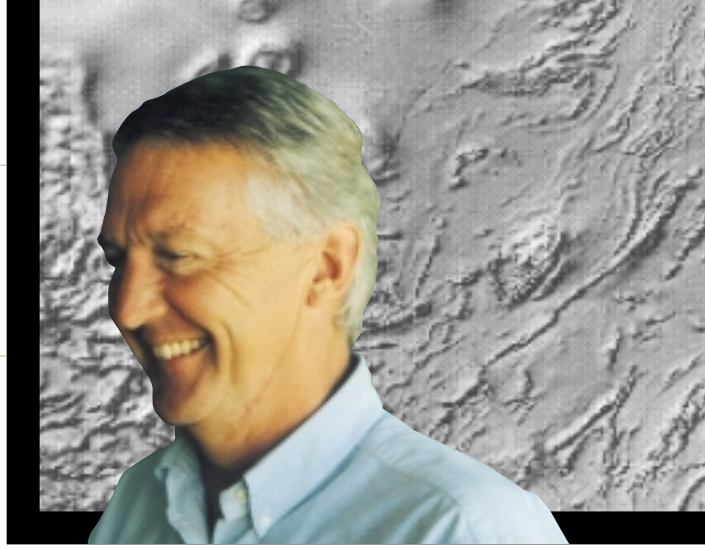
Two important points will contribute to the ability of this CRC to make a measurable impact. Firstly, to be predictive, we need to be far better than we are today at understanding the critical controls on ore formation in the context of the entire mineralising system. Secondly, in order to exploit a superior understanding of ore formation processes we must have a four dimensional view of the geology of a target area, i.e. an accurate reconstruction of the nature and timing of events that made the geology that we see at the surface, a three dimensional picture of what that geology now looks like at depth, and what the geology looked like at the time of ore formation. Through this combined understanding of the architecture of mineralised systems and the processes that formed them, much better use of exploration data and technologies can be made to develop new targeting tools that must ultimately gain wide industry acceptance.

Of great importance is the requirement to be relevant to the industry at all scales of operation and therefore research in this Centre aims to answer some important questions:

1. Why are some geological provinces well mineralised and what are the predictive signatures we can draw from the terrane and apply to terrane selection elsewhere?
2. Within particular provinces, how do we target mineralised systems or belts that have potential to contain “giant ore deposits”?
3. Having identified a mineralised system, how do we predict that an anomalous or altered zone contains a deposit and what are the predictive tools for targeting?
4. How do we predict the controls of high grade in and around ore deposits?

Perhaps, most importantly, we must convert this understanding into insightful judgements with minimal data for use by explorers, who are so commonly faced with small parts of the puzzle, yet are expected to make decisions that carry high price tags.

CHAIRMAN'S REPORT



The CRC for predictive mineral discovery (***pmd****CRC*) was established in response to an urgent need for knowledge and tools that could help to significantly reduce discovery costs in the mineral exploration industry. A number of industry studies in the past few years have shown that, despite record levels of expenditure and access to new technologies over the past 10-15 years, the average cost of discovery has risen to levels that are unattractive to investors and miners. As a result, investment in mineral exploration and related industry R&D has declined significantly.

Despite being born into this time of unprecedented upheaval and declining investment in the mineral exploration industry, the ***pmd****CRC* has had a very successful first year.

- Nine new participants, both exploration companies and government agencies, joined the CRC during 2001-02 as financial sponsors, more than doubling the number of sponsors from the time of commencement.
- Over 70 industry and government geoscientists from more than 20 companies and agencies participated in the project planning forums held across the country over the past year. This broad and deep consultation has produced an initial research program that is focused on the delivery of early, accessible and practical outcomes to the industry, as well as on exciting and innovative science. It has also demonstrated intense industry interest in and expectations of the ***pmd****CRC*. The Board has ratified the program, but has flagged its desire to see further integration, consolidation and collaboration in the second and third year programs.
- In September 2001, the Executive Research Committee (ERC) developed an exciting and ambitious, life-of-CRC vision of success, expressed as a set of particularly challenging strategic objectives for the CRC. The CRC management team has produced a very strong strategic plan based on these objectives, which the Board strongly endorsed at its last meeting. As a result, every process in the CRC is to be measured against the visionary objectives, and on its capacity to generate a *"fundamental shift in exploration practice"*.
- A first-class management team has been put in place. Bob Haydon and his head office team have set very high standards of professionalism, leadership, service and commitment. Standards which have been recognised by the First Year Review and a number of other external agencies, as well as by the researchers and our clients. Program managers and project leaders have delivered a very strong initial program, and have responded impressively to the demands for greater accountability, deliverability, integration and collaboration across the program.

Finally I would like to acknowledge the role of my fellow board members. The ***pmd****CRC* Board represents a somewhat new governance model for CRC's. It is small, (eight members, including the CEO and Chair), totally independent of the participants, and meets physically only twice a year. The six board members were chosen on the basis of what they could bring as individuals to the CRC, but within an overall balance of two members from the mineral exploration industry (Dr Tom Whiting and Mr Jeff Gresham), two with a strong background in research practice and application (Professor Paul Rossiter and Dr Larry Wakefield), and two to cover the various issues around intellectual property and commercialisation (Ms Edwina Menzies and Dr Frank Reid).

The Board focuses on governance rather than management, operates on a model drawn closely from best-practice in the commercial sphere, and is accountable to the core participants (shareholders) via an Annual General Meeting. It has been a steep learning curve for the Board in the first year, but we are comfortable that the program, systems and performance measures are in place to ensure that the ***pmd****CRC* begins to generate *"a fundamental shift in exploration practice"*.

Dr Mike Etheridge
Chairman

CEO'S REPORT

It is a great pleasure to present this report on activities for the first year of operation of the ***pmd**CRC*. It has been a year of wide consultation, careful planning and successful implementation of a broad-based research program. New partnerships have been made with industry in an extraordinary period of change in the minerals sector.

Strategic Planning and Research Implementation

The future success of our Centre is based firmly on engaging our industry in identification of research issues, participation in research design and review to promote early uptake of results. The efforts of the Executive Research Committee to develop our strategy for research, education and training around the goal of a "*fundamental shift in exploration practice*" has been an important first step and has built a strategic framework for Program Coordinators and Project Teams to develop and refine research projects.

The transformation in our strategic thinking from a focus on the five research objectives to a focus on creating a "fundamental shift" has been a critically important change in 2001-02. This was achieved with the enthusiastic help of the Executive Research Committee. The latter is a key decision making body in this CRC and is composed of sixteen industry representatives and senior researchers, whose collective experience and energy have made a powerful contribution to the strategic focus that the CRC now holds.

As a result of this effort we have evolved a strategic framework that defines critical success factors with specific actions and measurement criteria that will form the basis of developing a successful Centre. All our activities will now be aligned with the vision for success.

At several levels we have been highly successful to date in involving industry through our Project Development Teams, our AMIRA partnership and our industry mentors program. The integrated research programs that resulted from this consultative process span a wide range of areas and involve many geographically separate partners.

Centre Management and Support

Establishing the new Centre has involved setting up fresh management and administrative systems and support. The office refurbishment for the ***pmd**CRC* at the University of Melbourne was completed during late October and the three full time staff of the Centre relocated into the new office space at the School of Earth Sciences. I am extremely appreciative of the provision of this space and thank Professor Andrew Gleadow and the University of Melbourne for their strong support for the ***pmd**CRC* during this early phase.

An important part of this start-up has been finalising key management positions for Program Coordination in the Terranes, Architecture and Modelling Research Programs and also for the Education and Training portfolio.

Another important appointment has been Dr Max Richards as the Centre's Official Visitor for the period January 2001 through June 2004. Visitors are appointed to each CRC to assist with the monitoring and liaising role of the CRC Program and to provide informal advice to their respective Centres as required. Most importantly the Visitor helps to maintain a robust link between the Centre and the Program. Max Richards has had a distinguished career involving a range of senior management and governance positions in the minerals industry and related organisations and I look forward to Max's contributions in the years ahead.

Computational Modelling Workshop

Computational geoscience lies at the heart of our CRC and considerable effort has been placed during our first year on construction of our modelling research program. In December a successful workshop was conducted to finalise strategy and projects. The workshop was attended by almost 40 participants including partner and non-partner researchers together with industry representatives. It provided a strong framework for final research planning.

An important outcome of the workshop was that key technology gaps were identified, thus providing a focus for future software development within the CRC. In addition, industry and researchers supported the need for short-term software solutions to provide improved capabilities to solve less complex geological problems in parallel with a progression to a powerful software solution for fully coupled modelling. Importantly, there was also recognition and acceptance of a need for a broad education, training and marketing plan for modelling to build wider acceptance for the potential impact of this core CRC program. It has been pleasing to see such strong support for this work at this very early stage.

Commercialisation

Commercialisation of research outcomes may seem a long way off, nevertheless, in our first year we have introduced methods that will assist early planning for commercial outcomes. Our Commercialisation Advisory Committee met twice during the year to implement "Day 1 Planning" for commercial outcomes from our computational modelling program. Another component of our commercialisation strategy has been to set up a company, Ausmodel Pty Ltd, which holds Intellectual Property in trust for its core partners. Ausmodel held its first Board Meeting in January 2002.

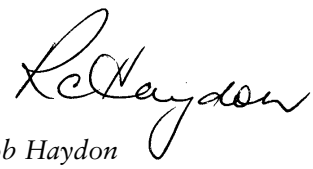
A Challenging Year for the Industry

For a new research centre devoted to mineral exploration, the past year has been extremely challenging given the continuing pace of mining company mergers, acquisitions and restructuring. Despite this, we have continued to gain strong financial support for the Centre. Although one of our major industry supporters Pasminco Exploration was a casualty of this climate, we enlisted nine new financial sponsors namely: WMC Resources, Barrick Gold, Sons of Gwalia, BHP-Billiton, Rio Tinto, NSW Department Mineral Resources, WA Geological Survey, Qld Department of Natural Resources and Mines and Primary Industry and Resources SA. This brings industry plus state government support to 14, with potential additional sponsors continuing to show interest in joining the Centre. Sadly, this climate of change did not escape our Core Participants with the announcement by La Trobe University of their intention to withdraw from the Centre and to close down the Earth Sciences Department. I extend my thanks to staff at La Trobe University for their input to the Centre to this point.

Successful First Year Review

A measure of our progress in this first year was the first year review of ***pmd****CRC* by the Commonwealth. This was conducted to examine progress towards establishment of operations for the new Centre. The review was positive and supportive and the review Panel identified no major issues in its review of operations and made no specific recommendations. No response from the Board was sought on any issues. This is a very pleasing outcome for us all.

As we enter our second year, I look forward to continued engagement of our research teams with our industry sector in an effort to deliver high impact results to all our sponsors and partners.



Dr Bob Haydon
Chief Executive Officer

STRUCTURE AND MANAGEMENT

The *pmd**CRC* is an unincorporated joint venture consisting of the following core partners:

AMIRA International
CSIRO Exploration & Mining
Geoscience Australia
James Cook University
La Trobe University *
Monash University
University of Melbourne
University of Western Australia

* announced retirement effective July 1, 2002.

*pmd**CRC* was established on July 1 2001 under the Commonwealth Government's Cooperative Research Centres Program Round 7 and will be funded for seven years. A Centre Agreement governs the constitution of the partners in the joint venture.

Board of Management

The management structure of the *pmd**CRC* is unique compared to other unincorporated CRCs as it has an independent Board of Directors. The structure of the Board is designed to ensure representation from industry, research and legal/commerce fields.

Members:

Dr Mike Etheridge (Chairman)	– SRK Consulting
Dr Bob Haydon (CEO)	– *pmd**CRC*
Mr Jeff Gresham	– Gresham Mineral Consulting Services
Ms Edwina Menzies	– Menzies George
Dr Frank Reid	– Australian CRC for Renewable Energy
Professor Paul Rossiter	– Curtin University
Dr Larry Wakefield	– Petroleum Industry Consultant
Dr Tom Whiting	– BHP Billiton

With overall responsibility for the CRC, the Board will ensure the Centre's activities are carried out in accordance with the provisions of the Commonwealth and Centre Agreements. The Board have convened twice in the reporting period.

Throughout the year, the Board, via the CEO has been supported by Advisory Committees, responsible for research and project development, commercialisation, and education and training.

pmd*CRC MANAGEMENT STRUCTURE

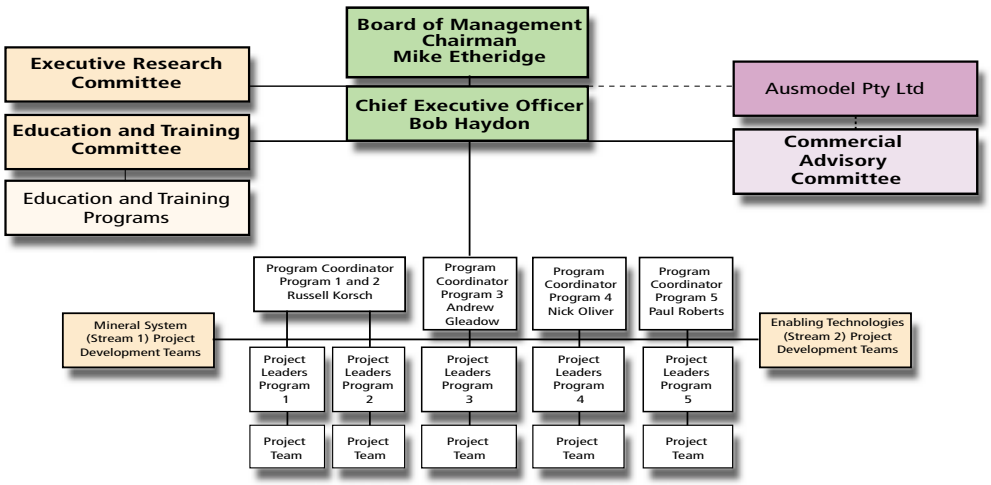


Figure 1

Executive Research Committee

The Executive Research Committee (ERC) is responsible for providing science leadership and management advice to Program Coordinators and the CEO. Four meetings have been held during the first year.

Members:

Mr John Anderson*	General Manager Exploration Australia, MIM Exploration
Dr Nick Archibald	Director, Fractal Graphics
Dr Graeme Broadbent	Principal Geologist, RioTinto Exploration Pty Ltd
Professor Ray Cas	School of Geosciences, Monash University
Mr Joe Cucuzza	Business Unit Leader, AMIRA International
Dr Mike Etheridge	Corporate Consultant, SRK Consulting
Dr Nick Fox	Chief Geologist Exploration, Anglogold Ltd
Professor Andrew Gleadow	Head, School of Earth Sciences, University of Melbourne
Dr Chris Gray	Head, Department of Earth Sciences, La Trobe University
Professor David Groves	Director, Centre for Global Metallogeny, University of Western Australia
Mr Greg Hall	Chief Geologist, Placer Dome Asia Pacific
Dr Jon Hronsky	Senior Geoscientist, Western Mining Corporation
Dr Russell Korsch	Research Group Leader, Geoscience Australia
Mr Terry Lees*	Senior Research Fellow, University of Melbourne
Professor Nick Oliver	Professor of Economic Geology, Department of Earth Sciences, James Cook University
Dr Alison Ord*	Research Group Leader, CSIRO Exploration & Mining
Mr Paul Roberts	Industry Liaison Leader-Computational Geoscience, CSIRO Exploration & Mining
* Participation:	Mr John Anderson – July 2001 to April 2002 Mr Terry Lees – July 2001 to January 2002 Dr Alison Ord – July 2001 to April 2002

Project Development Teams

Reporting to the ERC via the Program Coordinators, the Project Development Teams (PDTs) capture the research ideas and needs of industry sponsors and partners to define and recommend projects for consideration by the ERC. They subsequently monitor and review progress, and are a platform for technology transfer. PDTs conducted nine workshops at various nodes across Australia within the first year.

Commercial Advisory Committee

The commercialisation activities are overseen by a Commercial Advisory Committee, which reports to the Board via the CEO. Chairing the committee is Mr Peter Robson from Newport Capital in Sydney, who is an independent expert from the commercial sector. The committee operates as a working group and has conducted two meetings during the year. The first meeting was to conduct an assessment of commercialisation processes and opportunities for the CRC, and the second focused on intellectual property and commercialisation planning. The committee is currently working on a commercialisation plan for the Program 5 software modelling projects.

Members:

Mr Peter Robson (Chairman)	– Newport Capital
Dr Bob Haydon	– *pmd**CRC*
Mr Tim McLennan	– CSIRO Exploration & Mining
Ms Edwina Menzies	– Menzies George
Mrs Lisa Norden	– *pmd**CRC*
Mr Ray Soper	– Eureka Capital Partners Ltd

Education and Training Committee

An Education and Training Committee manage the Education and Training Program of the CRC. The committee is chaired by Dr Kevin Tuckwell from the Minerals Council of Australia, and reports to the Board via the CEO. This committee will ensure that education programs are both responsive to industry requirements and set high geoscience standards. Two committee meetings have been conducted in the first year.

Members:

Dr Kevin Tuckwell (Chairman)	– Minerals Council of Australia / MTEC
Dr Reid Keays (Interim Education and Training Coordinator)	– Monash University
Professor Ray Cas	– Monash University
Professor Andrew Gleadow	– University of Melbourne
Dr Alison Ord	– CSIRO Exploration & Mining
Professor Nick Oliver	– James Cook University
Dr Mark Barley	– University of Western Australia
Dr Chris Gray	– La Trobe University*

* July 2001 – June 2002

Management Meetings 2001-02:

Event	Venue	Date
Board of Management Meeting	University of Melbourne	8 and 9 November 2001
Board of Management Meeting	ARRC, Perth	11 and 12 April 2002
ERC Workshop	Little Bay, Sydney	10 and 11 August 2001
ERC Meeting	ARRC, Perth	29 September 2001
ERC Meeting	ARRC, Perth	5 December 2001
ERC Meeting	University of Melbourne	11 and 12 March 2002
Program Coordinators Meeting	AMIRA, Melbourne	3 and 4 September 2001
Program Coordinators Meeting	University of Melbourne	31 January 2002
Program Coordinators Meeting	University of Melbourne	28 and 29 May 2002
Commercialisation Advisory Committee Meeting	CSIRO, North Ryde	26 February 2002
Commercialisation Advisory Committee Meeting – Intellectual Property Workshop	ARRC, Perth	24 and 25 June 2002
Education and Training Committee	Minerals House, Brisbane	12 June 2001
Education and Training Committee	University of Western Australia	28 September 2001
Ausmodel Board Meeting	University of Melbourne	18 January 2002
First Year Review Meeting	University of Melbourne	25 March 2002

Table 1

COOPERATIVE LINKAGES

The reason for the existence of ***pmd****CRC* is to generate a fundamental shift in mineral exploration practice. We are working in a mature minerals industry in which there is enormous collective knowledge across a wide spectrum of stakeholders. Strong cooperative linkages are critical in our quest to produce outcomes that will have an impact on the exploration industry. We must access, integrate and build upon this collective base to analyse current ore deposit models in key terranes and major mineral deposit systems identified by the industry. This approach has helped to focus research on critical areas of uncertainty and controversy to develop much improved targeting tools.

Linkages across the Centre

The ***pmd****CRC* is setting new standards for collaboration between the Australian Economic Geology research community and the Exploration Industry to ensure potential outcomes meet industry needs. During our first year and prior to formal commencement of the CRC we embarked on research project planning through wide consultation with stakeholders. Our project planning process commenced with structured Project Development Teams engaging industry experts, government geoscientists and research partners to ensure project deliverables are carefully aligned with user needs. To date nine workshops of this kind have been conducted over nine days involving more than 100 person days. Research projects within each of the five Programs have been designed through this process. Research teams drawn from Australia and overseas will solve critical research issues identified by these teams. Each program shares project leadership from several organisations and therefore reduces the risk of isolation of individual projects from mainstream objectives. Each project involves several partners and many have industry mentors. The CRC now operates many large projects in an atmosphere of open communication between the researchers and industry sponsors. This enables advances to be rapidly communicated to all involved without the normal delays associated with collaborative sponsored research and publication secrecy. However the CRC also caters for 1:1 projects and collaborative projects through AMIRA International with limited confidentiality periods.

Improving integration and collaboration is a continual process for the CRC. Our formal project planning process concluded towards the end of our first year with the design of our first Project Integration workshop, in which all Project Leaders and Coordinators will work closely together to improve linkages, identify gaps and seek opportunities for better cross project research integration.

Our unique management structure is designed to promote cooperation. We have no industry advisory committees, instead we have embedded the industry within our structure at all levels, from project definition (Project Development Teams), through to review and recommendation (Executive Research Committee), and approval (the Independent Board). Regular project meetings and workshops are a feature of our modus operandi. We are developing our website and provide regular updates of important news via a quarterly in-house newsletter.

International Linkages

The minerals industry has become a global business. Our supporting partners now include major international organisations that have substantial business in Australia. These include AngloGold, MIM, Placer Dome, BHP Billiton, WMC Resources, Rio Tinto and Barrick Gold. Participation of a large number of mineral exploration companies is facilitated by representation through AMIRA International.

We have developed close associations with international research groups, including Rock Deformation Research (RDR) at Leeds University, Imperial Collage, London and the Saskatchewan Research Council (SRC) Canada, through specific project involvement.

External National Linkages

Through our core partners of five universities, Geoscience Australia and CSIRO we represent a focus for research excellence in Economic Geology. Nevertheless, we are conscious of the need to develop linkages to all national groups, especially those that enable us to provide advanced inter-disciplinary graduate, post-graduate, post-doctoral and industrial training in predictive mineral discovery. To facilitate this, the ***pmd****CRC* has:

- A supporting partnership with the Minerals Council of Australia (MCA) to stimulate education and training in Economic Geology at all levels, both within tertiary research centres and industry through the education program initiated by the MCA;
- Initiated early discussions with CODES, TMC and MRT to work together on collaborative research on the West Coast of Tasmania;
- Established closer ties with NSW Department of Mineral Resources and NTGS to acquire important research datasets directly relevant to areas of exploration interest to the industry;
- Involved researchers from Australian National University in key projects;
- Developed alliances or entered into early discussions with a number of service companies and specialist groups including:
  Fractal Graphics, Perth;
  Encom, Sydney;
  Rockfield Software, Townsville;
  SRK Consulting, Perth; and
  ITASCA, Minneapolis.
- Conducted early discussions to cooperate with Australian supercomputer facilities especially ACcESS MNRF, VPAC and IVEC. The ***pmd****CRC* and ACcESS share the same Chairman of their respective Governing Boards.

Opportunities for strong cooperation with CRCLEME have been identified and acted upon where we have complementary research programs in specific Australian regions. At a recent cross disciplinary Conference "Victoria Undercover – Collaborative Geoscience in Victoria" convened in Benalla by CSIRO Exploration & Mining, representatives of both CRC's saw opportunities for strong cooperative links. These were pursued and initiatives formalised to work together on projects based in the Yilgarn in Western Australia and in Western Victoria.

Dr Barry Murphy (JCU) and Mr Terry Lees (Uni. of Melb.)

Research Linkages

PROJECT	RESEARCH PARTNERS	INDUSTRY PARTNERS/MENTORS	OTHER COLLABORATORS
C1 Understanding and predicting the location of the Broken Hill ore deposit	University of Melbourne CSIRO JCU La Trobe University Monash University		NSW DMR Consolidated Broken Hill PIRSA GA Fractal Graphics Pasminco
Y1 Tectonostratigraphic and structural architecture of the Yilgarn Craton	UWA GA Monash University	AMIRA WMC AngloGold GSWA	
Y2 3D Geological models of the Eastern Goldfields province, Yilgarn Craton	GA UWA University of Melbourne	WMC AngloGold Sons of Gwalia	GSWA Fractal Graphics AngloGold Australia Placer Granny Smith Research School of Earth Sciences (RSES)
Y3 Camp- to deposit-scale multiple alteration and ore footprints	UWA CSIRO	Sons of Gwalia Placer Dome Barrick	Gold Fields Gold Harmony
I1 Mt Isa Western Succession: 3D basin architecture. structural geometry and ore systems	GA JCU University of Melbourne	MIM	Pasminco
I2 Total systems analysis of the Mt Isa Eastern Succession	JCU GA University of Melbourne Monash University CSIRO	AMIRA	Fractal Graphics
I4 Predictive discovery of Mt Isa-style iron sulphide Cu (-Au) mineralisation	Monash University JCU CSIRO	MIM	
T1 Predictive targeting of large Au deposits in Western Victoria	University of Melbourne La Trobe University CSIRO	MPI	GSV
T2 Tanami gold mineralising system: a pilot study	JCU	AngloGold	
G7 Placer project giant sediment-hosted gold systems	CSIRO UWA	Placer	
G8 AngloGold mineralising system project	CSIRO	AngloGold	
A1 What are the fundamental characteristics of mineralised fault systems?	Monash University La Trobe University GA	WMC MIM	University of Tasmania ANU
A2 ASTER – Data for the Curnamona province	CSIRO		PIRSA
H1 Application of Re-Os isotopes to geochronology, ore forming models and exploration	Monash University University of Melbourne CSIRO		

PROJECT	RESEARCH PARTNERS	INDUSTRY PARTNERS/MENTORS	OTHER COLLABORATORS
H2 Pb-Pb step-leaching as a possible means of dating mineralisation, metamorphism and deformation	University of Melbourne GA Monash University CSIRO JCU La Trobe University		Pasminco
H4 $^{40}Ar/^{39}Ar$ dating of mineralisation, metamorphism and deformation	University of Melbourne GA CSIRO Monash University	MPI	
H5 Modelling and visualisation of multi-dimensional thermochronologic data sets	University of Melbourne CSIRO		ANU RSES Imperial College, London
F1 Fluid chemical paths in ore forming processes	JCU GA Monash University UWA CSIRO		University of Melbourne SA Museum ANU
F2 The development of conceptual multiphase hydrothermal and magmatic process models for reactive transport in deforming fractured rock masses	CSIRO JCU		
F3 Micro-metallogeny of hydrothermal fluids	JCU GA CSIRO Monash University LaTrobe University UWA		ANU
F4 A neural, taxonomic or self-organisational approach to classification of hydrothermal mineral deposits.	University of Melbourne JCU UWA CSIRO		University of Melbourne – Botany Department
M1 Modelling software framework	CSIRO	Fractal Graphics	ACcESS APAC VPAC IVEC Pinnacle Blue
M2 Earth process software development	CSIRO GA UWA JCU		ACcESS Rockfield Software ITASCA Tectonics Special Research Centre RDR, Leeds
M3 Applications of numerical modelling to mineral exploration problems	CSIRO UWA		

Table 2

RESEARCH

Current Research Program Design

This CRC will develop a true systems approach to exploration utilising quantitative computational modelling as the platform for data synthesis, analysis and improvement in ore system and target prediction. This approach is designed to complement and extend the capabilities of the empirical approach to prospectivity analysis.

The research programs are structured into two streams that are designed to enhance integration and linkage amongst the research programs.

The Projects in Stream 1 are concerned with specific geographic terranes or research issues that are of priority to the mineral exploration community, or that have been selected as data-rich "laboratories". The current terranes are the Yilgarn, Curnamona, Mt Isa Inlier and Western Victoria. The Projects in Stream 2 are of an "enabling technologies" nature in that they are concerned with developing and applying technologies and concepts to answer the problems identified in the Stream 1 Projects. The integration of Programs is depicted in the figure below (Figure 2). The wide resource base and funding arrangements in the Centre provides a unique opportunity to develop a series of fully integrated projects incorporating 3D geology, fluid studies, innovative geochronology and computational modelling to solve key mineral exploration issues and lead to practical exploration tools that focus on improving targeting techniques for superior deposits.

Research Objectives

Five research objectives have been developed as a framework for research programs designed to develop a vastly improved understanding of mineralising processes and a 4D understanding of the evolution of the geology of mineralised terranes. The research objectives are to:

1. Contribute to resolution of the key areas of uncertainty in current models for the formation of major economic mineral deposit types, within mineralised terranes having high exploration priority;
2. Build 3D and 4D images and histories of well known mineralised systems, within their regional exploration context;
3. Create a computational environment to simulate the 4D evolution of mineral systems with the goal of ranking and prioritising different exploration scenarios, and predicting location, and quality of ore deposits;
4. Create a commercial computational, visualisation and communications environment to allow companies to manage exploration and operational activities more efficiently at a distance; and
5. Transfer these concepts, skills and technologies into the Australian mineral exploration industry, educational scene and investor/management environment to assure a long term competitive advantage to the industry.

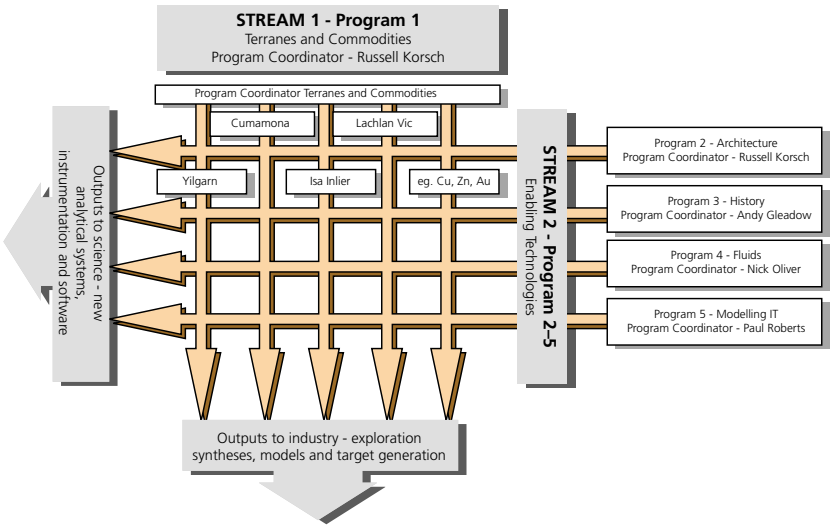


Figure 2. Integration of Stream 1 and Stream 2 projects.

All research is conducted within projects in one of three categories:

- Type I projects are one-on-one projects that are currently conducted in partnership with one major participating company and predominantly funded by the company.
- Type II projects are collaborative projects that are funded through Centre resources.
- Type III projects are collaborative projects of the conventional AMIRA type funded largely by a group of sponsors that may or may not be CRC participating companies.

AMIRA International, as an agent for the industry members and potential sponsors, is a core participant of the *pmd*CRC* and works in partnership with other participants in an endeavour to ensure industry's on-going support of the CRC through continued sponsorship. In year 1 some existing AMIRA projects that fit with the CRC research objectives have been rolled into the activities of the Centre as Type III projects and are listed as such in the table below.

Current Research Projects:

STREAM 1			Project Type
Program 1	C1	Understanding and predicting the location of the Broken Hill ore deposit	II
	Y1	Tectonostratigraphic and structural architecture of the Yilgarn Craton	II
	Y2	3D Geological models of the Eastern Goldfields province, Yilgarn Craton	II
	Y3	Camp- to deposit-scale multiple alteration and ore footprints	II
	I1	Mt Isa Western Succession: 3D basin architecture, structural geometry and ore systems	II
	I2	Total systems analysis of the Mt Isa Eastern Succession	II
	I4	Predictive discovery of Mt Isa-style iron sulphide Cu (-Au) mineralisation	I
	T1	Predictive targeting of large Au deposits in Western Victoria	II
	T2	Tanami gold mineralising system: a pilot study	I
	G7	Giant sediment-hosted gold systems - Placer Dome	I
	G8	AngloGold mineralising system - AngloGold	I
STREAM 2			
Program 2	A1	What are the fundamental characteristics of mineralised fault systems?	II
	A2	ASTER - data for the Curnamona province	I
Program 3	H1	Application of Re-Os isotopes to geochronology, ore forming models and exploration	II
	H2	Pb-Pb step-leaching as a possible means of dating mineralisation, metamorphism and deformation	II
	H4	$^{40}Ar/^{39}Ar$ dating of mineralisation, metamorphism and deformation	II
	H5	Modelling and visualisation of multi-dimensional thermochronologic data sets	II
Program 4	F1	Fluid chemical paths in ore forming processes	II
	F2	The development of conceptual multiphase hydrothermal and magmatic process models for reactive transport in deforming fractured rock masses	II
	F3	Micro-metallogeny of hydrothermal fluids	II
	F4	A neural, taxonomic or self-organisational approach to classification of hydrothermal mineral deposits	II
Program 5	M1	Modelling software framework	II
	M2	Earth process software development	II
	M3	Applications of numerical modelling to mineral exploration problems	II
AMIRA			
	P223E	Applications oriented EM modelling	III
	P552	Fluid flow in Mt Isa and McArthur Basins	III
	P624	An integrated geological and metallogenic framework for the Eastern Yilgarn Craton	III
	P685	Automated mineralogical logging of drill core, chips and powders	III
	P700	Predictive magnetic exploration models for porphyry, epithermal and iron oxide Cu-Au deposits	III
	P710	Stratigraphic and structural architecture of the Agnew-Wiluna Belt, Western Australia	III

Table 3

Stream 1

Program 1 – Terranes and Commodities

Program Coordinator:
Dr Russell Korsch, Geoscience Australia

Objectives:

- To understand the crustal and mantle scale structure of mineralising systems by integrating data obtained through the most relevant tools and then utilising and modelling data from specific terranes;
- To build conceptual exploration models to predict how to flush metals-fluids-ligands from source, through rock, and to deposit them in a predictable place at a predictable time; and
- To apply enabling exploration technologies in Stream 2 (Programs 2-5) to determine what record these mineralising processes have left in the crust. In particular the research will define the geochemical and geophysical expressions of these processes and determine how they are associated with particular orebody types.

The CRC is applying this methodology to the high priority areas shown below in order to resolve some of the fundamental questions that impede the development of robust exploration models:

- Ascertain the role of single stage versus multiphase processes in mineralising systems;
- Determine the significance of mineralising processes in space and time and whether there are systematic controls on these patterns and how this impacts on exploration; and
- Recognise new types of mineralising processes and exploration environments.

Development of the research program has principally been achieved by the selection, in conjunction with industry sponsors, of several "flagship" terranes and the establishment of terrane-specific Project Development Teams. These teams consist of representatives from our industry sponsors and AMIRA along with key researchers, and have been responsible for developing the current research projects. An informal mentoring system has also been established, with key industry people agreeing to act as mentors to the projects.

Yilgarn Craton

Project Y1-AMIRA P763 (Leader: Mark Barley): Tectonostratigraphic architecture of the Eastern Yilgarn Craton. The aim of this project is to constrain the history of terrane accretion, deformation, volcanism, sedimentation and metamorphism, and to develop an architectural and thermal history for the Eastern Yilgarn Craton, culminating with a prediction of the thermal structure of the crust during gold mineralisation. This prediction will allow insights into the source of mineralising fluids and of gold. This project follows, and builds on the work completed in the AMIRA P624 project, and will be circulated to industry for AMIRA sponsorship. Detailed planning has been completed and it is due to commence its research program in early 2002-03.

Project Y2 (Leader: Bruce Goleby): 3D geological models of the Eastern Goldfields Province, Yilgarn Craton. This project aims to build feasible 3D geological models of the Eastern Goldfields region of the Yilgarn Craton to enable prediction of where within the terrane, the location of major gold deposits are likely to occur. The first major activity has been the processing of deep crustal seismic reflection data from the northeast Yilgarn Craton that was acquired in late 2001 by Geoscience Australia and the Geological Survey of Western Australia (through the CRC). The data were released into the public domain at a workshop in Perth in June 2002. Geological interpretation of these data has commenced, along with the preliminary construction of 3D geological models for the Kalgoorlie region and the Leonora-Laverton region including the incorporation of the Norseman-Menzies 3D model acquired from partner Fractal Graphics.

Project Y3 (Leader: Steffen Hagemann): Camp to deposit-scale multiple alteration and ore footprints. This project aims to predict the alteration and geochemical signature of the "gold-related" hydrothermal event(s) within complex overprinted gold mineral systems. Hence, it will be able to predict fertile areas within these hydrothermal alteration systems, by developing mineralogical and geochemical criteria to characterise Au-transporting (those capable of containing ore grade) and barren hydrothermal fluid systems and model Au (metal) transport and deposition, in the Yilgarn Craton. Close liaison

has been developed with our industry sponsors, and two non-sponsoring companies, Gold Fields and Harmony provide access to their leases to conduct this project. A significant amount of field work has already been conducted in the St Ives and Kalgoorlie areas, and an Honours student is working on the Argo gold system.

Hemi 60 Vibrators

Mount Isa Province

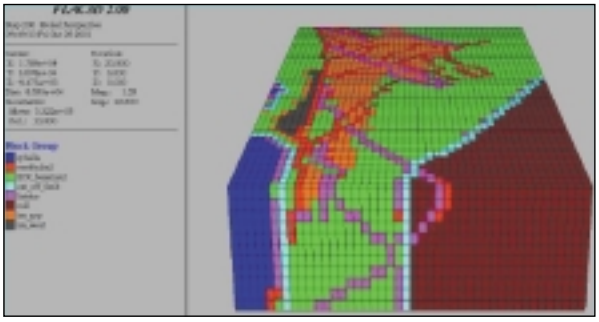
Project I1 (Leader: George Gibson): Mt Isa Western Succession: 3D basin architecture, structural geometry and ore systems. Through a better understanding of the geological controls on existing sediment-hosted Pb-Zn-Cu deposits in the Western Succession, this project aims to derive the key geological parameters that will increase the predictive ability of the exploration industry to locate blind or as yet undiscovered mineral deposits beneath cover elsewhere in northern Australia. A core aspect to this work, which is well under way, involves interpretation of multiscale wavelet data ("worms") derived from Fractal Graphics processing of two sets of regional potential field data. The aeromagnetic worm data has been provided to the CRC by MIM Exploration, and the ground gravity data has been supplied by industry (BHP Billiton, Placer Dome) and government (Queensland Department of Natural Resources and Mines, Geoscience Australia) collaborators. Leonardo Feltrin, a PhD student enrolled at JCU, has commenced on the project to work on Pasminco's Century Mine in the Western Succession.

JCU PhD student Leonardo Feltrin outside Century Mine

Project I2 (Leader: Tom Blenkinsop): Total systems analysis of the Mount Isa Eastern Succession. By linking conventional exploration databases in the Eastern Succession with (a) numerical potential field (wavelet) analysis ("worms"), (b) advanced microanalytical metal path tracers and (c) a fully fused geochemical, tectonothermal, and tectonostratigraphic model, this project will generate a comprehensive prospectivity analysis for Fe-oxide-Cu-Au (IOCG) and related deposit styles. A database termed "The Mount Isa Eastern Succession Knowledge Database" is being constructed to capture the results of over 135 PhD, MSc and BSc theses relating to the Eastern Succession. Over 100 maps have been assessed to determine the spatial extent of key features (e.g. alteration, structural features, mineralisation), and each map area will be rectified and overlain on a basemap with the relevant geocoded information. A core aspect of this work in this project, similar to I1, also involves interpretation of multiscale wavelet data ("worms"). Field work to assess key ingredients of the IOCG system has been undertaken, and Lucas Marshall, a PhD student based at JCU, has commenced work on tectonothermal aspects of the Cloncurry region and an Honours student is working on the Cloncurry Fault.

Project I4 (Leader: Paul Gow): Predictive discovery of Mount Isa-style iron sulphide Cu-Au mineralisation. The key goal of this project is to create a process model for formation of the copper orebodies at Mount Isa, and to take this model into the broader Mount Isa region and elsewhere to predict the location of new deposits. The project relies heavily on integration of the structural and geochemical aspects of the research to formulate process models for ore formation, which are then

forward-modelled numerically to help delineate the critical factors for developing large and high grade systems. This project is a one-on-one project between MIM Exploration and the CRC, with researchers at Monash and James Cook Universities, and CSIRO. Melissa Gregory, a PhD student based at Monash University, is working on aspects of the hydrothermal systems in the Mount Isa Valley. The first year of the project has focused on development of the process model based on work in the Mount Isa Valley. In the coming year the project will consolidate the process model with further analytical and mapping work in the Mount Isa Valley, as well as beginning to examine other copper systems in the region.



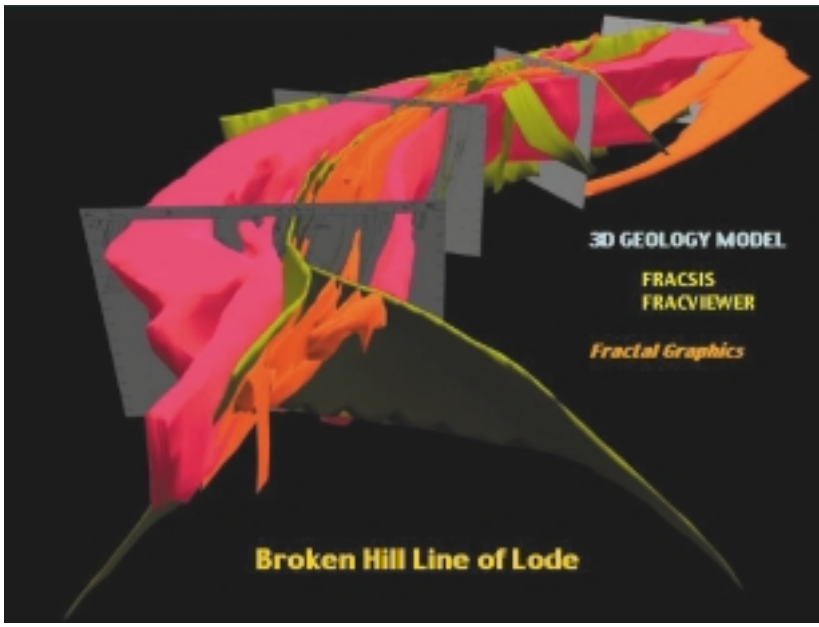
Block Model derived from GOCAD for input into FLAC3D

Curnamona Province

Project C1 (Leader: Terry Lees): Understanding and predicting the location of the Broken Hill ore deposit. The aim of the project is to clearly identify the target signature of the Broken Hill deposit within the regional data sets, and clarify for the first time, the history and timing of structural and fluid (alteration, mineralisation) events. This will identify critical terrane characteristics for this deposit style and outline the geophysical and geochemical footprints of ore and alteration that are applicable to the search for this and other styles of deposit globally. The main work completed to date has been a Pb isotope study on small deposits in the Curnamona district. Caroline Forbes, a PhD student based at Monash University, is working on aspects of structural, metamorphic and thermochronological evolution of the terrane, and two Honours students are working on aspects of the Broken Hill deposit.

Other Terranes

Project T1 (Leader: Chris Wilson): Predictive targeting of large Au deposits in Western Victoria. This project has evolved to be a Flagship



Modelling Project for the CRC based on enhancing the existing one-on-one project with one of our industry sponsors, MPI. The project is strongly supported by the Board because it offers an early opportunity to build a fully integrated project with few Intellectual Property restrictions. The prospect of having MPI drill-test predictive concepts developed from a fully integrated research program is very exciting, and is precisely aligned with the Vision and Strategy of the CRC.

Milestones

Program milestones outlined in the Commonwealth Agreement for year 1 have been reached:

Milestones	Status
Form and assemble stakeholder Project Development Teams for each terrane (1st Qtr Year 1)	Complete
Conduct Project Definition stakeholder workshops to identify high impact exploration issues(2nd Qtr Year 1)	Complete
Review existing data and develop strategy for integration (Year 1)	On-going
Identify data acquisition requirements (Year 1)	On-going

At an individual project level, detailed project agreements were finalised based on these milestones and research activity is well underway. Future research will be reviewed and monitored against deliverables and milestones outlined on a project by project basis.

Stream 2

Program 2 - Mineralising Systems Architecture

Program Coordinator:
Dr Russell Korsch, Geoscience Australia

Objectives:

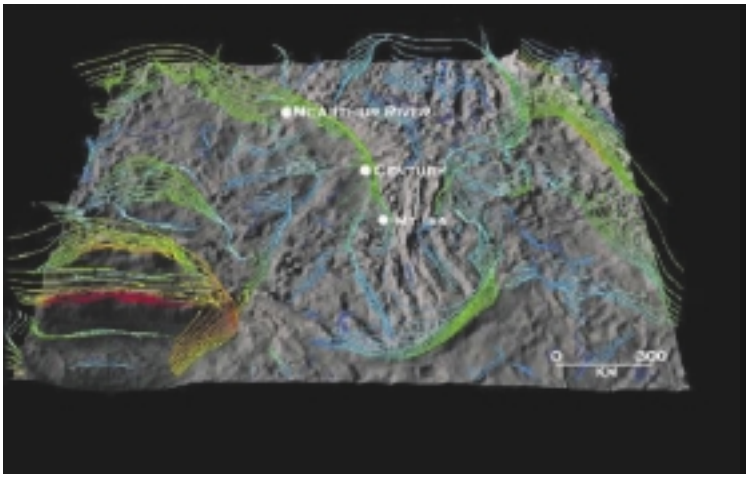
- To demonstrate the effective integration and visualisation of remotely sensed data derived from new exploration technologies and ground-based mapping in building 3D geological models of the architectural framework and alteration patterns associated with specific mineralising systems;
- To delineate the dimensions and distribution of alteration patterns related to system evolution and to identify diagnostic geophysical and geochemical signatures for specific mineralising systems, which have wider relevance to exploration elsewhere; and
- To understand the crustal and mantle scale structure of mineralising systems by integrating data obtained through the most relevant enabling technologies, and to use this to improve our understanding of mineralising processes.

Project A1 (Leader: Frank Bierlein): What are the fundamental characteristics of mineralised (trans-lithospheric) fault systems? The aim of this project is to understand why some fault systems are mineralised and why others are barren, and to determine if a mantle component is essential to form major ore deposits. An industry mentor has provided strong input into the development of the work program, with the first major activity being the development of a database that will enable the determination and ranking of principal characteristics common to mineralised and/or unmineralised fault systems. Several key areas have been selected for detailed field studies to commence in late 2002 and early 2003. These include the Boulder-Lefroy Fault (in collaboration with Project Y3) and the Mt Isa Fault (in collaboration with Project I4). Ivo Vos, a PhD student based at Monash University, has commenced working on a tectonic synthesis of the Tasmanides orogenic system, and will investigate and compare selected fault systems in the Phanerozoic of eastern Australia, and assess the critical parameters responsible for a major mineralising event at 440Ma.

Project A2 (Leader: Robert Hewson): ASTER data for the Curnamona province. This project involves Primary Industries and Resources South Australia (PIRSA) and CSIRO. ASTER satellite data of the Broken Hill Block, including 27 scenes of radiance at the sensor imagery (Level 1B), surface reflectance, surface emissivity and brightness temperature imagery (Level 2) and digital elevation model data (Level 4) were downloaded from the USGS/NASA web site. Early results include the mosaicing of ASTER bands data products from shortwave infrared (SWIR) and thermal infrared (TIR) ASTER Level 1B scenes. The application of simple band ratios of SWIR ASTER data has produced first order approximate sericite and AlOH mineral maps. More detailed analysis of the comparisons between calibrated radiance at sensor and reflectance values for overlapping or coincident scenes is currently being investigated.

Milestones

Program milestones involving stakeholder consultation and project definition have been reached.



Oblique view of North Australian gravity with upward continued worms.

Program 3 - Mineralising Systems History

Program Coordinator:
Professor Andrew Gleadow,
University of Melbourne

Objectives:

- To document and understand the sequence of events and range of pressure, temperature and fluid compositions to which a prospective terrane has been exposed;
- To recognize which of these events and processes have been most critical to ore formation;
- To produce 4D structural, metamorphic and hydrothermal system models at terrane and deposit environment scales in order to generate the geological background necessary for a series of both focused and broad fully coupled simulations in Program 5; and
- To combine the outcomes of current area selection practices with ongoing and new theoretical models of ore genesis using small teams of industry, government and academic researchers.

The Mineralising Systems History program aims to chart the regional- and deposit-scale thermal evolution and ore-depositional history of key mineralised terranes. The program will identify and characterise the elements and events in these histories that relate directly to ore-formation using a range of existing and new approaches. This will involve:

- Documenting and understanding the sequence of events to which a prospective terrane has been exposed, in relation to the range of pressure, temperature and fluid compositions and recognition of which of these events and processes have been most critical to ore formation;
- Careful and rigorous field documentation of a range of directly applicable methods of high precision geochronology and isotope systematics as an essential prerequisite for confirming or refuting exploration models; and
- Contribution to the development of 4D structural, metamorphic and hydrothermal system models at terrane and deposit environment scales in order to generate the geological background necessary for a series of both focused and broadly fully-coupled simulations in Program 5.

During the first year, a project development and planning process involving VIEPS, EGRU, CGM-UWA, CSIRO, and GA, has defined a final program of four projects. Of these two (H2 and H4, below) have been completely documented and began work in the early part of 2002. Both are

VIEPS Argon Dating Facility

Multi-Collector Inductively-Coupled-Plasma Mass Spectrometer

making excellent progress. Two other projects are in the final phase of documentation and expected to begin in mid-2002. During the planning process it was agreed to apply as many of the geochronological systems as possible in concert to two demonstration terranes as natural laboratories in which the systems can be fully evaluated against each other. These two demonstration terranes are Western Victoria and the Broken Hill area. The integrated approach will then be transferred to various terrane projects in Program 1 as soon as practicable. This will involve various exploration companies depending on the particular system being considered, or on a site/terrane-specific basis.

Project H2 (Leader: Janet Hergt): Pb-Pb step-leaching as a possible means of dating mineralisation, metamorphism and deformation. This project aims to develop Pb-Pb step-leaching protocols, enabling researchers to date individual mineral growth/equilibration events in complex polymetamorphic and/or mineralised terranes. The technique is being applied to silicate minerals in the first instance and will be extended to include ore-stage minerals in an effort to determine if the timing of mineralisation might also be constrained by this approach. A robust method for the preparation, step-leaching and isotopic analysis of Pb in garnets from metapelites is now available and being applied to samples from the Southern Cross area, Curnamona Craton. The study of a rolled-in PhD student, Maurizio Tonelli, is part of this project and is nearing completion.

Project H4 (Leader: David Phillips): $^{40}Ar/^{39}Ar$ dating of mineralisation, metamorphism and deformation. The main objective of this project is to evaluate traditional $^{40}Ar/^{39}Ar$ dating methods applied to syngenetic potassium-bearing minerals, such as white mica, and develop new, innovative techniques for constraining the timing of mineralisation as well as the thermal and structural history of ore systems, using the two natural laboratories of the Western Victoria and Broken Hill terranes. A key focus of the project is the development and application of high spatial resolution, UV laser-based $^{40}Ar/^{39}Ar$ micro-dating techniques that will include the direct dating of fluid inclusions. Applications to the environment of the Stawell gold mine in Western Victoria are proceeding with a new suite of samples prepared and undergoing analysis. Currently the project involves collaboration between Melbourne and Monash Universities and MPI. Further collaboration with EGRU at JCU is planned.

Milestones

Program milestones outlined in the Commonwealth Agreement for year 1 have been reached. Project definition stakeholder workshops to identify high impact research issues, project documentation and the initial phases of research have been completed.

The Mass Spectrometer in use by PhD student Maurizio Tonelli.

Program 4 Fluid Sources, Transport and Deposition Processes

Program Coordinator:
Professor Nick Oliver, James Cook University

Objectives:

- To identify the reservoirs of metals and fluids in mineralising systems;
- To identify the physico-chemical parameters that promote and sustain metal transport;
- To constrain and predict depositional processes for a full range of ore deposit types;
- To generate new predictive concepts for ore formation through novel reclassification and integrated modelling of ore systems; and
- Together with programs 1 and 5 understand the interplay between architecture, geodynamic history and history of fluid flow and chemical gradients in the formation of large tonnage, high grade mineral deposits.

This program acts as an essential bridge between the terrane based projects and the Modelling program. The operational process in this CRC is to assemble and create the best new outputs from geological and geophysical study of the terranes (Program 1), and then to apply state-of-the-art analytical and process-determining techniques to these outputs, in order to produce "soft" or conceptual models of the generation of metalliferous ore deposits (Programs 2 through 4). We are then in a position to transfer these soft models into the Modelling program (Program 5) for simulation and prediction of orebodies. Iteration occurs at all stages with feedback in the total loop, as well as between individual programs and projects.

Industry, in particular, has recognised that knowledge and data gaps exist in the area of "fluids" in ore-forming environments, in part because of the difficulty of measuring and interpreting data that pertains to ancient fluid flow. In order to achieve these aims, work in four key projects has been planned and commenced. F1, F2 and F3 are all multi-institutional projects that have commenced with very positive review and planning meetings, held between February and April 2002. Comprehensive work plans have been produced for 2002-03 financial years, and all projects are proceeding at, or faster than, the rate of outputs stated as milestones in the Commonwealth Agreement. F4 is a pilot project involving one key researcher and a small number of collaborators.

Project F1 (Leader: Nick Oliver): Fluid chemical paths in ore forming processes. This project aims to determine, for each deposit type being considered in the terranes, the hydrothermal geochemistry of the transport and deposition of ore forming components, with the broader view of substantially improving ore deposit models. Generation of a "standard" database (eventually to be web-enabled) of thermodynamic properties of minerals and fluids has been initiated. Regional alteration and fluid mixing patterns in the genesis of Cloncurry style Fe-Cu-Au ores has been successfully modelled, and collaboration with Moscow State University has tackled the hardest theoretical question in this field – the chemistry of the two-phase fluid field.

Project F2 (Leader: Bruce Hobbs): The development of conceptual multiphase hydrothermal and magmatic process models for reactive transport in deforming fractured rock masses. This project is concerned with understanding interactions between chemical and mechanical processes during the mineralising process. Derived algorithms will provide the input to M2 needed for fully coupled modelling. The focus is on solving the most outstanding geological problems that hinder our capacity to provide realistic input into numerical models. Algorithms have been written to describe porosity generation and collapse in hydrothermal systems, suitable for importing into the modelling program. Conditions where fault valve pumping is likely to be important for the transport of significant volumes of hydrothermal fluid have been defined in FLAC, and new software is being trialled that may enable coupling of fracturing and fluid flow.

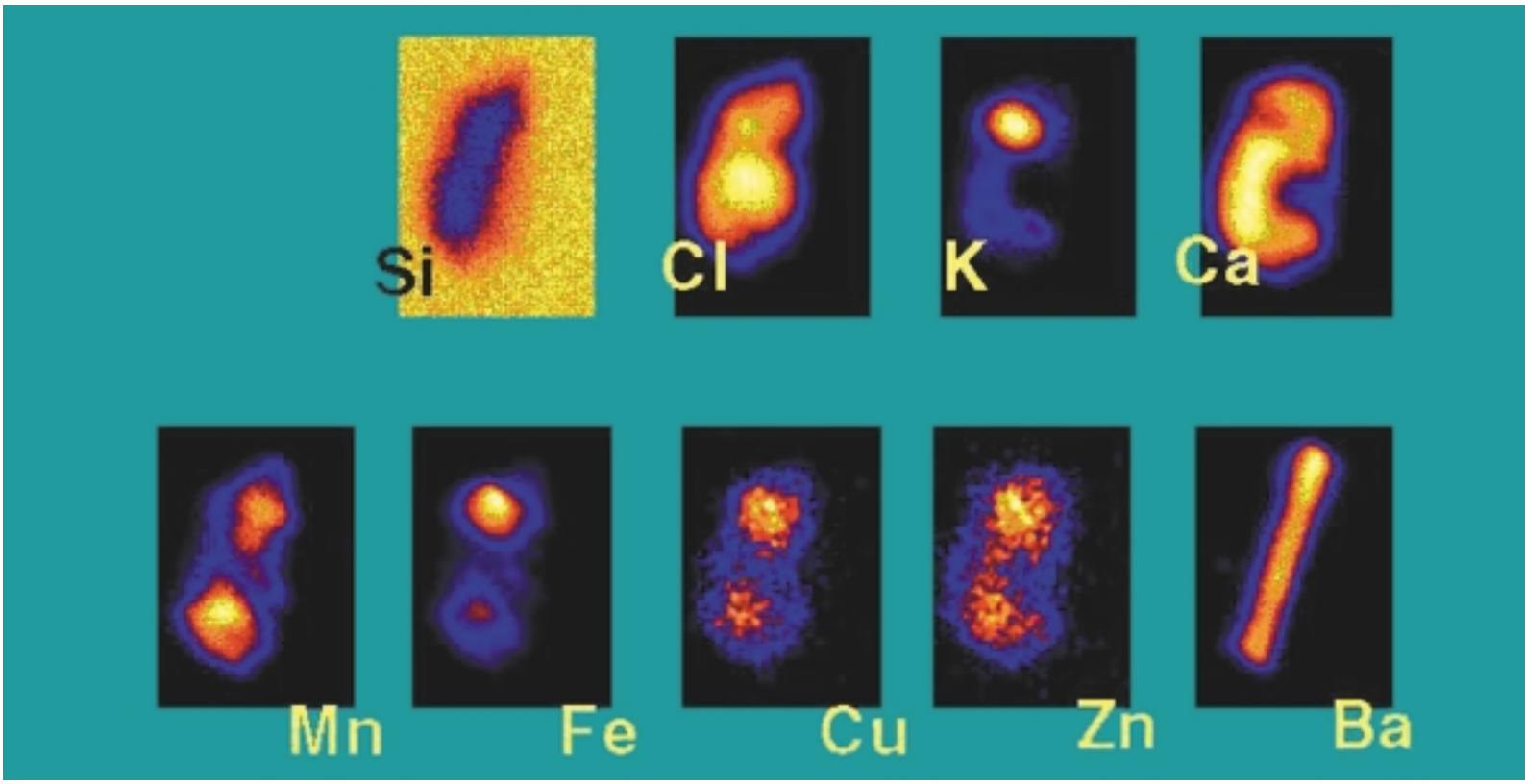
Project F3 (Leader: Tim Baker): Micrometallogeny of hydrothermal fluids. This project is using a range of recently developed microanalytical tools to directly sample "fossil" fluid inclusions trapped in ore forming environments. As well, we have established a key link and committed resources to world-class groundbreaking high salinity experiments. These advances will pave the way for a predictive capacity for fluid chemical pathways in the ore environment. We are addressing the differences between barren regional sodic-calcic alteration and mineralised Cu-Au-Fe-oxide systems in the Cloncurry District, a theme postulated some time ago but not rigorously tested. Integration of cutting-edge PIXE and LA-ICP-MS microanalysis techniques has been tested through analysis of metal-rich, high salinity fluid inclusions, and database development with web-based access is under way and includes plans to integrate the widely used MacFlincor program, and hence provide the world's first interactive database for fluid inclusion research.

Project F4 (Leader: Terry Lees): A neural, taxonomic or self-organisational approach to classification of hydrothermal mineral deposits. This project is applying systematic taxonomy to the classification of mineral deposits. The approach has the potential to look at similarities and relationships between various mineral deposit styles, derive hierarchies of controlling variables, and from this generate new ways of establishing key factors common to ore deposition in different geologic environments. Encouragingly, sufficient interest from biologists at the University of Melbourne has been attracted in order for this project to proceed rapidly. It is clear from the initial results that expansion is warranted, and links to other projects must also be developed and strengthened. For example, this project is a proxy for a general deposit database that could be accessed by many other researchers in the CRC as well as industry at large. It will also lend itself to comparison and interchange with other numerical techniques (such as geological inversion) that are being developed in the modelling program. As a question-raiser and a "seed" for many alternative ideas on mineral deposits, it has already demonstrated great potential.

Several researchers are involved in two or more of the fluid projects and this is promoting cross project integration at a high level. None-the-less, further ways to stimulate industry involvement in this key program are being sought.

Milestones

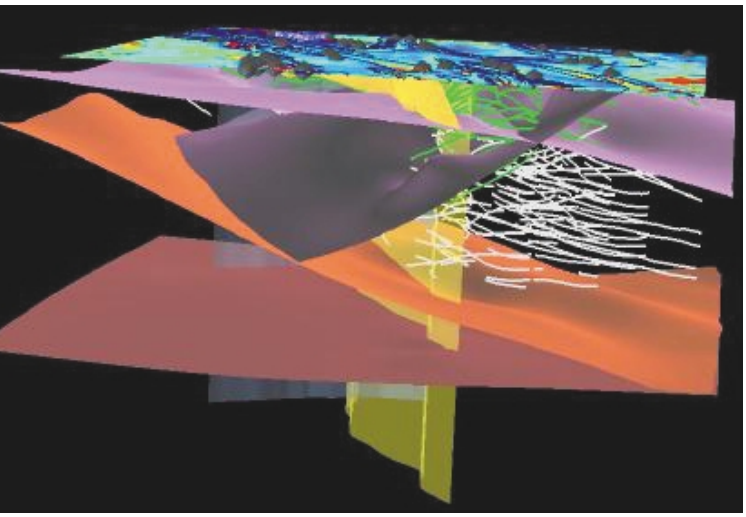
Program milestones for year 1 have been reached. Comprehensive work plans have been produced for 2002-03 years, as a result of stakeholder workshops. Research activities are under way and on track.



Ore fluid characterisation from advanced fluid inclusion research.

Program 5 - Computational and Interactive Visual Modelling of Mineralising Systems

Program Coordinator:
Mr Paul Roberts, CSIRO Exploration & Mining



3-D Modelling

Objectives:

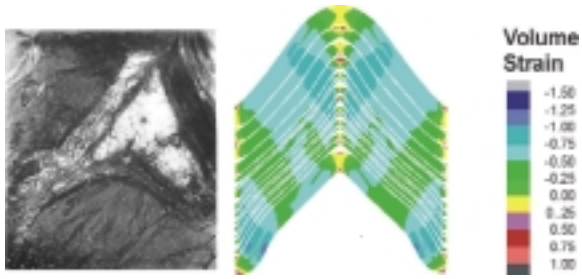
- To develop environments for the management, storage and transfer of the data from field observations to numerical modelling using XMML;
- To develop and implement three dimensional very large deformation thermo-mechanical modelling packages (with modules for porous-flow, multi-phase-flow, chemistry, erosion) capable of realistic physical simulation of geomaterials, and geological structures on an extreme range of scales; and
- To design and implement an Interactive Visual Modelling System (IVMS) based upon these three dimensional very-large-deformation, thermo-mechanical, chemical, fluid flow modelling packages.

Underlying these research objectives is the intention to build a numerical modelling system that can be used by mineral explorers to understand their target ore systems, and through this understanding, lower their discovery costs dramatically.

Development of projects to underpin these research objectives was strongly influenced by a successful workshop held at CSIRO in Perth in early December 2001. The project structure flowing from that workshop is divided into three principal areas:

- Project M1 – Modelling Software Framework
- Project M2 – Earth Process Software Development
- Project M3 – Applications

Achievements in year 1 of the CRC and activities planned for year 2 are listed below:



Modelling saddle reef geometry

Project M1 (Leader: Peter Hornby): Modelling software framework. The overall design of the modelling software framework was developed (see Figure 3). The underlying software engineering philosophy is that the whole software environment is modular. In this way, existing software can be used to the maximum extent possible with a consequent saving of cost and time. When certain software products are no longer useful they can be replaced with better software without having to redesign the whole system. Other benefits include the development of a single user interface area rather than having to develop an interface for each piece of software to make the system "user friendly", common access to standardised databases and common access to the developing inversion in geology software. Data transfer is all via XMML.

The first prototype of the IVMS was already in existence by the end of year 1. Because of the relatively late start of the approved programs within the CRC, most developments in 2000-01 were funded externally to the CRC, and have now been brought into the CRC mostly as background CSIRO Intellectual Property. Nevertheless, significant advances were made with the development of the 3DMACS prototype, which enables physical model representations to be built

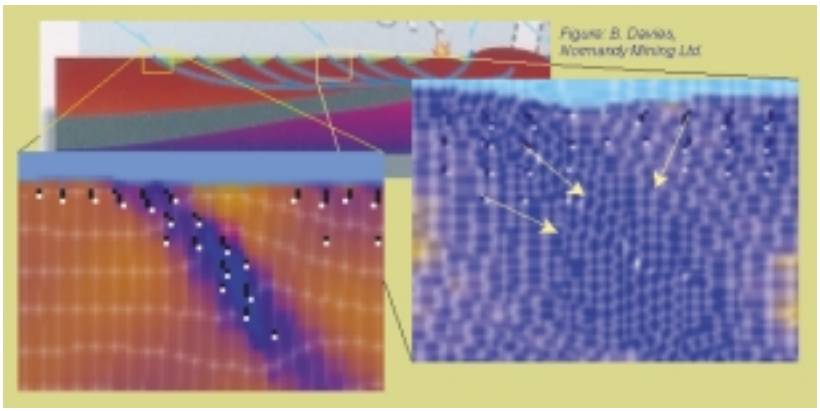
and visualised in GOCAD, and fully coupled numerical modelling of earth processes in some particular examples to take place in FLAC and FASTFLO. All of this is underpinned by data transfer using XMML. While this first prototype only partly fulfils the design objectives, much of the work done to get to this point will benefit the year 2 developments along the path to full modularity.

Recruitment of two new programmers was in progress by year end. Work on this project will therefore accelerate rapidly in year 2, the initial focus being on writing the interfaces, improving the functionality of the inversion in geology module and adding it into the system.

Project M2 (Leader: Alison Ord): Earthprocess software development. The project design was influenced heavily by the December 2001 workshop which identified the following critical areas where improved functionality of experimental modelling codes is required:

- Rock brittle behaviours in a hydrothermal environment;
- Magmatic processes – emplacement, thermal effects, and fluid generation;
- Reactive transport modelling – specifically for phase separation, kinetics and complex chemistry; and
- Multi-scaling, or the functionality to model earth processes over a range of scales (e.g. crustal to ore body scale) in a single model.

This project also started slowly, with the principal activities being a workshop in March (shared with project F2) to review the way forward in addressing the above problems, and a program of thoroughly testing the ELFEN software package, particularly in addressing the issues of rock brittle behaviours in a hydrothermal environment. This project has also benefited by externally funded improvements in the use of the CSIRO-developed code FASTFLO for reactive transport modelling which have now been brought into the CRC.



A numerical simulation reproducing a conceptual diagram of tectonics and fluid flow.

As with M1, recruitment of two positions was underway at year end. Work in this area will accelerate rapidly in year 2. The initial focus will be on the reactive transport and rock brittle behaviour modules, where substantial improvements in experimental modelling software functionality can be expected.

Project M3 (Leader: Paul Roberts): Applications of numerical modelling to mineral exploration problems. This is essentially an interface research environment, between the pure research and development areas of projects M1 and M2 and the minerals industry. It is also where educational products are developed. Thus in M3, the IVMS will be tested on various non-terrane projects, lessons will be learned and recorded in an accessible format, user requirements will be identified and user-friendly, simplified IVMS modules (or "templates" – see Figure 3) will be developed. These lessons and requirements will then fed back into the developing IVMS thereby ensuring that work under both research objectives 2 and 3 deliver to the overall CRC objective.

This project includes experiments in interactive visual modelling in non-terrane ore environments. The first of the non-terrane test sites, a project in Hunan province, China is expected to come into the CRC early in year 2. In addition, efforts at generating other such projects had commenced. Several such projects can be expected to commence in year 2.

As with M1 and M2, recruitment was underway at year end – in this case for an exploration industry oriented researcher. In year 2, all of the previous CSIRO work in this area will be compiled into an accessible form. Based on this material, the first modelling courses for postgraduate students and industry will be developed. Test modelling exercises will be carried out at non-terrane industry sites as a basis for developing templates for modelling dilation and alteration in various ore environments. An 'Earth Systems Modelling Group' will be developed within Project M3 to enhance the education and training needs of the Program.

Finally, in year 1, Program 5 researchers have been significantly involved in conducting experiments in interactive visual modelling on other ***pmd****CRC* projects, specifically in the Isa Terrane through project I4.

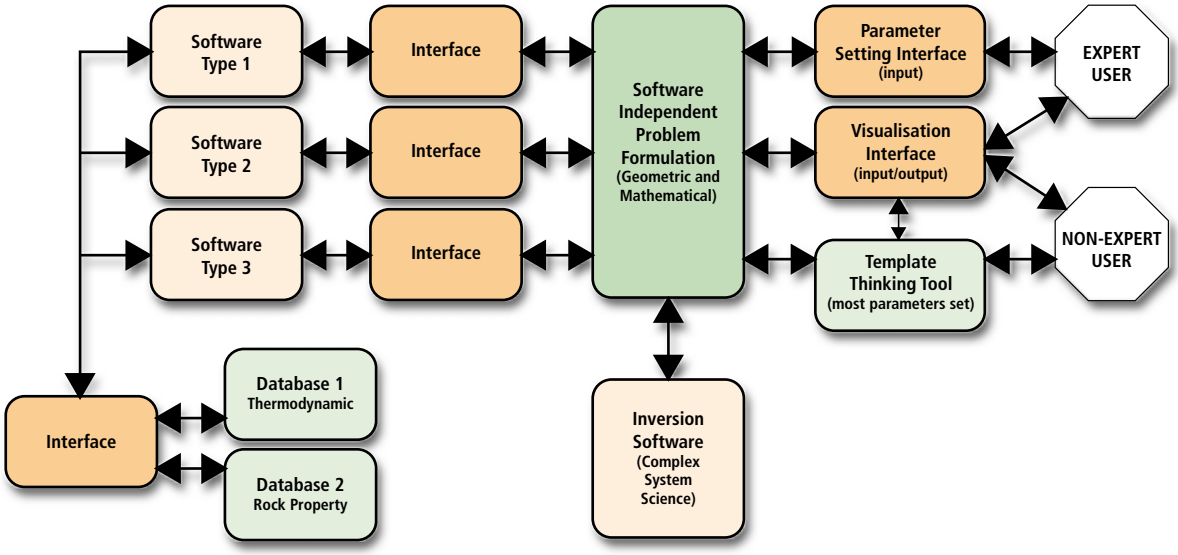
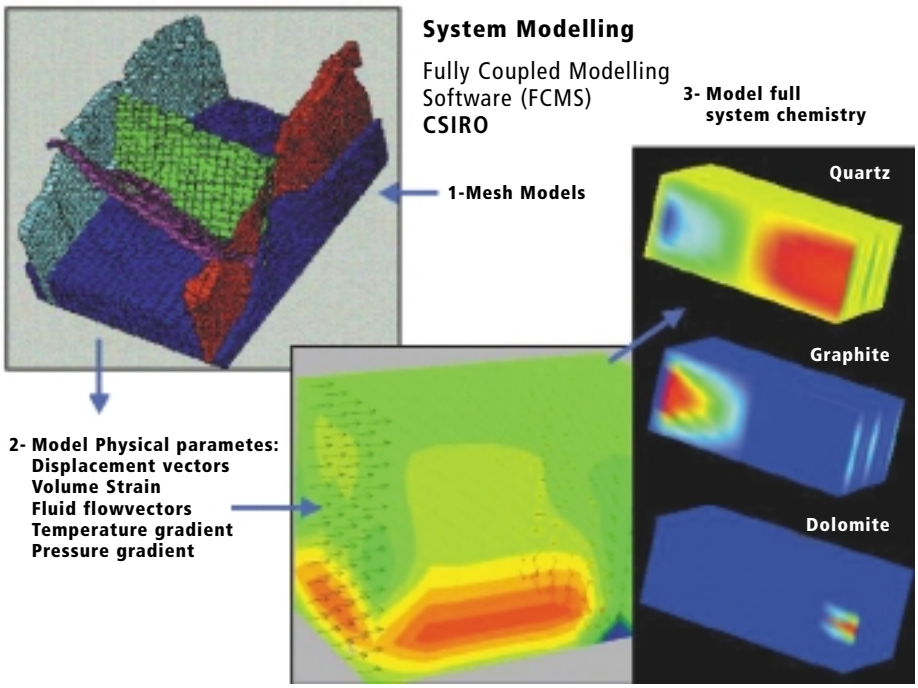


Figure 3: Principal Elements of the Software Framework

Milestones

The status of Program milestones outlined in the Commonwealth Agreement is tabulated below:

Milestones	Status
Formation of a consortium of software companies interested in developing and commercialising components of the ***pmd**** Interactive Visual Modelling System (IVMS) software and communications framework	Options for partners considered at commercialisation workshop
Development of experimental modelling codes	On-going
Conducting of experiments in interactive visual modelling for ***pmd****CRC* participants within Program 1	On-going
Development of an "in-house" prototype IVMS	Complete



EDUCATION AND TRAINING

Program Coordinator (Interim):
Professor Reid Keays, Monash University

The Role of Education and Training in *pmd*CRC*

A major measure of the success of *pmd*CRC* will be the adoption of the new knowledge and skills generated in the Centre, by practitioners in the minerals industry. Technology Transfer will pass directly to the participants in the CRC through seminars, workshops and published articles. Much of the knowledge and skills generated by *pmd*CRC* will be garnered through research projects involving postgraduate research students; these same students will also be involved in the dissemination of the knowledge and the application of the skills on graduation. The graduates of the Education and Training Program will represent a new generation of geoscientist who will be better equipped to be successful in the discovery of mineral deposits.

Establishing a Strong Platform in Year 1

The basis for strong future development of our Education and Training Program has been built in year 1 through the efforts of Professor Reid Keays who has filled the interim role of Education and Training Coordinator for our first year. This period has seen development and the first phase of implementation of a program plan and strategy. The plan identified two key objectives of the Program and associated strategies and key actions that the Education and Training Committee believe are necessary to meet those objectives.

The first program objective concentrates on strengthening postgraduate research and recognises the importance of identifying well-aligned projects and of attracting high quality, postgraduate students committed to achieving the goals of the CRC. Processes were developed for selecting students and research projects and for allocating various forms of scholarship support. These were agreed by the Education and Training Committee and are being applied in the recruitment of research students into the CRC. This was a challenging task given the extremely

JCU PhD students and academics

short time frame and the additional constraint that the broader research programs were still being finalised by the ERC. The following table lists the eight CRC postgraduate students working on CRC research topics. The Education and Training Committee has endorsed a list of more than 50 PhD project proposals and will work closely with the key researchers at the participating institutions to attract additional postgraduate students in subsequent years of the CRC.

The second program objective is focused on achieving high quality outcomes in knowledge and technology transfer of the research outputs of the CRC. Key actions include the development and conduct of conferences, workshops and targeted shortcourses, and the dissemination of research news through the CRC website. A very successful Modelling and IT workshop was conducted in December 2001 and attracted about 30 participants. Events such as this will continue to be major parts of the Education and Training agenda.

Professor Keays will hand over leadership of the Program to Dr Lucy Chapman in August 2002 to develop the program in coming years. Dr Chapman will be based at the JCU node of the CRC.

Objectives

The objectives of the Education and Training program will be achieved through six subprograms:

Monash University PhD student Ivo Vos

Objective 1: Strengthening Research for Predictive Mineral Discovery

Subprogram 1: Postgraduate Research

The CRC aims to build up and maintain a cohort of at least 30 postgraduate research students at any given time. Joint supervision of research students by personnel from industry, Geoscience Australia, , CSIRO, as well as Academe will be attempted wherever possible. The major part of our efforts in year 1 has been directed towards identifying PhD research projects and recruiting high quality students. Attraction of only eight students in our first year was disappointing, however, the short period between start up and call for university scholarship applications did not position us well to attract a full quota. We expect an improvement in our intake for commencement of 2003 as a result of our year 1 project planning process.

Subprogram 2: Visiting Fellows

Our visiting fellows program is an important initiative for year 2 to attract eminent researchers to spend periods of time within the ***pmd****CRC*. A priority for these visitors will be to spend time interacting with students and conducting workshops and shortcourses. We believe that this program will further enhance the intellectual environment and provide an international context for the work of our students.

Subprogram 3: Honours Projects

To date two honours students are supported in one research project in Program 1. A program of integrated Honours projects will be developed to link closely with research programs in the CRC and will form the basis for on-going postgraduate research within the ***pmd****CRC*.

Objective 2: Knowledge Transfer and Training for Predictive Mineral Discovery

Subprogram 4: Shortcourses

An existing "tool" for the CRC is the newly formed National Geoscience Teaching Network (NGTN). The five university partners in *pmd*CRC* are all members of the NGTN, which is funded by the Minerals Council of Australia (MCA). The objective of the NGTN is to build a strong industry-focused education program to enhance the training of mineral industry students at all levels:

- At the undergraduate program level within each of the participating universities;
- At the BSc (Honours) level where a National Honours program of shortcourses in the minerals science area has just been created; and
- At the Masters level where a National Course Work Masters program has also just been created.

This program, which will be delivered by the NGTN, is specifically designed for geoscientists working in industry who wish to upgrade their skills levels through a coursework MSc for credit. The new program is an extension of coursework MSc programs currently offered in the Departments of Earth Sciences at the University of Tasmania, the University of Western Australia, and James Cook University.

Closely linked with our shortcourse program is the "Earth Systems Modelling Group" referred to in Program 5.

The Earth Systems Modelling Group will add to this effort by:

- Developing and delivering both conventional and e-based courses for students and industry personnel to learn about the uses and value of numerical simulation in solving earth process problems;
- Developing computer-based educational tools, searchable databases of past studies and training manuals for the use of practitioners and students alike; and
- Supervising WA-oriented MSc and PhD research projects using the numerical modelling technology under development by CSIRO.

Together with the NGTN, *pmd*CRC* will be able to offer a very innovative program which will ensure that students will receive the best mineral science training possible. The *pmd*CRC* involvement in this program is at an early stage of development and will accelerate in year 2.

Subprogram 5: Seminars and Workshops

The *pmd*CRC* will transfer new knowledge gained in the CRC to the participants through a series of regular seminars, shortcourses and workshops. During our first year we have focused on research planning workshops through our Project Development Teams. From this we have developed an industry mentor program, where senior industry geoscientists have accepted nominations as project mentors and champions. This concept will be pursued throughout the Centre. To date, our project mentor program extends across three projects in the Yilgarn, one major project in Victoria, and a major project in Mt Isa.

Subprogram 6: Distance Education

Continuous upgrading of the skills of personnel in the exploration industry is important to the success of the exploration effort, but this is made difficult because geologists commonly work in remote areas, well removed from educational institutions. To circumvent this problem, the NGTN will develop a series of presentations (for example, key seminars given by visiting overseas specialists) that will be available on the Web. Coursework modules will also be available on the Web and a series of teaching/research CD-ROMs will be prepared. Development of this subprogram is at an early stage.

Current *pmd*CRC* PhD Students

Student	University	Thesis Topic	Supervisor
Melissa Gregory	Monash	Hydrothermal alteration around the Mt Isa Copper ore system.	Dr Andy Wilde Dr Frank Bierlein
Caroline Forbes	Monash	Structural, metamorphic and thermochronological evolution of the Broken Hill and Curnamona terranes.	Dr Gordon Lister Dr Peter Betts
Ivo Vos	Monash	Reconstruction of the evolution of the Tasmanides in Eastern Australia with special emphasis on the 440Ma event.	Dr Frank Bierlein
Maurizio Tonelli	Melbourne	Pb-Pb step leaching: a new geochronological tool for high grade polymetamorphic terranes.	Associate Professor Janet Hergt Dr Jon Woodhead
Chris Wijns	UWA	Exploring geodynamic models of tectonics and fluid flow.	Professor David Groves Dr Alison Ord Dr Roberto Ferrez Weinberg
Leonardo Feltrin	JCU	Structural Evolution and Metal Distribution of the Century Zinc Deposit.	Professor Nick Oliver Dr Tom Blenkinsop Mr Ian Kelso (Pasminco)
Lucas Marshall	JCU	Brecciation and Metasomatism of the Corella Formation, Eastern Fold Belt, Mt Isa Inlier.	Professor Nick Oliver Dr Mike Rubenach Dr Chris Salt (MIM)
John McLellan	JCU	Numerical Modelling of Deformation and Fluid Flow in Hydrothermal Systems.	Professor Nick Oliver Associate Professor Jeff Loughran Dr Alison Ord

Milestones	Status
Selected BSc (Honours) short courses and MSc coursework subjects in place and available for participating universities to share	Existing through NGTN
Protocols for placement of PhD students	In progress
Protocols for flexible delivery in place; selected course modules available on the Web	Incomplete
Protocols for Visiting Research Fellows and scientists	Incomplete
Analysis of training needs for industry	Incomplete
Guidelines established for access and use of Data Metallogenica	Under assessment

UTILISATION AND APPLICATION OF THE RESEARCH: COMMERCIALISATION AND LINKS WITH USERS

Objectives

- Create a commercial computational, visualisation and communications environment to allow companies to manage exploration and operational activities more efficiently; and
- Transfer these concepts, skills and technologies into the Australian mineral exploration industry, educational scene and investor/management environment to assure a long term competitive advantage to the industry.

The CRC will create two types of outputs; knowledge based and technology based advances. Knowledge based advances include enhanced scientific principles, know-how and general expertise in specialist fields. Technology based advances are the tangible Intellectual Property suitable for licensing and commercial transfer and include software code, international standards, data management and archive processes and protocols, analytical technologies and other patentable materials. These new technologies will form a basis for manipulation, management and visualisation activities of the CRC. Key elements for utilisation and commercialisation of outputs include:

- Establishing a computational modelling group as an incubator for a commercial spin-off;
- Developing commercial software outputs;
- Developing and implementing a proactive marketing program over the seven-year period of the CRC that involves forming strategic alliances with existing service industries and venture capital/finance institutes; in particular the ACcESS MNRF;
- Developing new and expanding existing SME's to capture more of a global market in the use of information technology and web-based systems and processes in this field;
- Transferring knowledge-based developments into the Australian mining and Information Technology and Telecommunications (IT&T) industry via workshops, training and education programs, scientific and trade communications; and
- Establishing a Commercial Advisory Committee including representatives of end users (e.g. State Governments, industry, service companies, venture capitalists and financial institutions) to add value to technology-based research and utilisation.

The CRC's technology-based outputs are well positioned for the global export market due to the nature of the IT&T customers, use of WWW technology and the operational nature of the minerals industry.

Knowledge-based developments will be transferred into the Australian mining and IT&T industry via workshops, training and education programs, along with scientific and trade communications. Enhancing the general IT&T knowledge base of Australian Minerals Industry is a key outcome for the CRC.

Intellectual Property Management

Identification, management and protection of Intellectual Property is a cornerstone activity for the successful commercialisation program. Confidentiality is an important issue in protecting early developments and processes not suitable for patenting and it is recognised that this will have an impact on the publication procedures and protocols of the Centre.

The Centre manages its commercialisation process via Ausmodel Pty Ltd. The company is a proprietary limited company, incorporated under the Corporations Law. Ausmodel Pty Ltd will hold the Centre's Intellectual Property in trust for the

partners. Management and commercialisation of the Intellectual Property will be in accordance with a Management and Trust Deed between the CRC members and the company. The company will commercialise IP via a series of Trusts held by the company with the potential for third party (investor or commercialisation partner) involvement. The role of the Commercial Advisory Committee will be important in guiding the Board on appropriate commercial procedures.

Ownership of Intellectual Property by the core participants will be decided on a project-by-project basis according to contributions made to that project by the core participants.

Activities during the first year have primarily been developing strategies and setting-up processes to benefit from the Intellectual Property generated by the CRC. An Intellectual Property Strategy and Register has been prepared and approved by the Board. Background Intellectual Property is being recorded in the Register, and an audit process has been established. Project Agreements have been completed for all current projects detailing the equity sharing and ownership of Intellectual Property. The Commercialisation Advisory Committee has been active in Intellectual Property workshops and is working on a commercialisation plan for Program 5 modelling software.

Milestones	Status
Inaugural meeting of Commercialisation Advisory Committee - December 2001	Complete
Development of Commercial Education Strategy through Education and Training Committee by July 2002	Commenced
Conduct training courses in Intellectual Property management and Commercialisation early Year 1 and annually thereafter	Complete

STAFFING AND ADMINISTRATION

During the first year of the CRC, key appointments were finalised in the Centre. To assist the CEO, Bob Haydon, in the administration of the office, Beverley Allen and Lisa Norden were appointed as Personal Assistant and Business Manager respectively. Lucy Chapman was appointed as Education and Training Manager, and Russell Korsch was appointed as Program 1 Coordinator in addition to Program 2 Coordinator. Dr Korsch was also appointed Deputy CEO of the Centre. Paul Roberts was appointed as Program 5 Coordinator.

The Specified Personnel in the Commonwealth Agreement are currently being updated with the Commonwealth to reflect the new appointments, and upon approval, will be as follows:

Left to Right – Lisa Norden, Beverley Allen and Bob Haydon

Specified Personnel

Title and Name	Contributing Organisation	% time in CRC	Role in CRC
Dr Bob Haydon	CRC	100%	CEO
Mrs Lisa Norden	CRC	100%	Business Manager
Dr Russell Korsch	Geoscience Australia	80%	Deputy CEO and Program 1 Coordinator Terranes Program 2 Coordinator Architecture
Professor Andrew Gleadow	University of Melbourne	20%	Program 3 Coordinator History
Professor Nick Oliver	James Cook University	50%	Program 4 Coordinator Fluids
Mr Paul Roberts	CSIRO	75%	Program 5 Coordinator Modelling
Dr Lucy Chapman	James Cook University	50%	Program 6 Coordinator Education and Training

The administrative offices of the Centre are in the School of Earth Sciences at University of Melbourne.

The following Tables detail the researchers who are contributed to the Centre by partners, and those funded by Centre resources.

In-Kind Research Staff Resources

Name	Main Activity	Total % of Time	% Spent on Research Program					Total on Research	% Spent on Program		
			Terranes	Architecture	History	Fluids	Modelling		Education	Commercial	Admin
University of Melbourne											
Dr Rod Brown	R	10%			10%			10%			
Prof Andrew Gleadow	A	11%						0%			11%
A/Prof Janet Hergt	R	13%			13%			13%			
Dr Kevin Hill	R	5%	5%					5%			
Dr Nick Hoffman	R	6%	6%					6%			
Dr Roland Maas	R	10%	2%		8%			10%			
Mario Melhem	R	50%			50%			50%			
Dr David Phillips	R	21%			21%			21%			
Prof Ian Plimer	R	6%	6%					6%			
Dr Stan Szczepanski	R	21%			21%			21%			
MaurizioTonelli	R	50%			50%			50%			
Dr Malcolm Wallace	R	8%	4%					4%	4%		
Prof Chris Wilson	R	12%	12%					12%			
Total		223%	35%	0%	173%	0%	0%	208%	4%	0%	11%
Monash University											
Dr Stephen Beresford	R	30%	30%					30%			
Dr Peter Betts	R	20%	5%	15%				20%			
Dr Frank Bierlein	R	30%		30%				30%			
Prof Ray Cas	R	15%	10%					10%			5%
Prof Jim Cull	E	15%						0%	10%		5%
Caroline Forbes	R	100%	100%					100%			
Melissa Gregory	R	40%	40%					40%			
Prof Reid Keays	E	10%						0%	10%		
Dr Geordie Mark	R	25%	15%			10%		25%			
Ivo Vos	R	25%		25%				25%			
Dr Andy Wilde	R	5%	5%					5%			
Total		315%	205%	70%	0%	10%	0%	285%	20%	0%	10%
La Trobe University											
A/Prof Chris Gray	A	5%						0%			5%
Dr Peter Jackson	R	5%	5%					5%			
Dr Bob Musgrave	R	10%	5%	5%				10%			
Dr Guowei Xu	R	10%	10%					10%			
Total		30%	20%	5%	0%	0%	0%	25%	0%	0%	5%
James Cook University											
Dr Timothy Baker	R	30%	10%			20%		30%			
Dr Tom Blenkinsop	R	20%	20%					20%			
Leonardo Feltrin	R	50%	50%					50%			
Prof Bob Henderson	E	15%						0%	15%		
A/Prof Jeff Loughran	R	5%				5%		5%			
Lucas Marshall	R	50%	50%					50%			
John McLellan	R	50%				25%	25%	50%			
Prof Nick Oliver	R	63%	23%			40%		63%			
Dr Mike Rubenach	R	60%	50%			10%		60%			
Mohammad Sayab	R	12%	12%					12%			
Dr Pat Williams	R	35%	20%			15%		35%			
Total		390%	235%	0%	0%	115%	25%	375%	15%	0%	0%
University of Western Australia											
A/Prof Mark Barley	R	23%	23%					23%			
A/Prof Mike Dentith	R	15%	15%					15%			
Marco Fiorentini	R	40%	40%					40%			
Prof David Groves	R	15%	15%					15%			
Dr Steffen Hagemann	R	20%	20%					20%			
Dr Neil McNaughton	R	10%	10%					10%			
Dr Bill Stone	R	30%	30%					30%			
Dr Roberto Ferrez Weinberg	R	5%	5%					5%			
John Williamson	A	10%						0%			10%
Total		168%	158%	0%	0%	0%	0%	158%	0%	0%	10%

Name	Main Activity	Total % of Time	% Spent on Research Program					Total on Research	% Spent on Program		
			Terranes	Architecture	History	Fluids	Modelling		Education	Commercial	Admin
Geoscience Australia											
Dr Evgeniy Bastrakav	R	15%				15%		15%			
Ben Bell	R	5%	5%					5%			
Dr Richard Blewett	R	5%	5%					5%			
Dr Kevin Cassidy	R	30%	30%					30%			
Dr David Champion	R	30%	30%					30%			
Ed Chudyk	R	60%	60%					60%			
Tanya Fomin	R	50%	50%					50%			
Dr George Gibson	R	30%	30%					30%			
Dr Bruce Goleby	R	34%	30%	4%				34%			
Dr Jim Jackson	R	50%	50%					50%			
Dr Leonie Jones	R	60%	60%					60%			
Dr Russell Korsch	A	50%						0%			50%
Dr Terry Mernagh	R	5%				5%		5%			
Malcolm Nicoll	R	40%	40%					40%			
Dr Chris Pigram	A	5%						0%			5%
Andrew Retter	R	30%	30%					30%			
Dr Peter Southgate	R	55%	55%					55%			
Alan Whitaker	R	5%	5%					5%			
Total		559%	480%	4%	0%	20%	0%	504%	0%	0%	55%
CSIRO Exploration & Mining											
Dr Graham Carr	A	15%	5%					5%			10%
Kim Covil	R	6%					6%	6%			
Dr Simon Cox	R	3%					3%	3%			
Dr Reem Freij-Ayoub	R	20%					20%	20%			
Dr Gordon German	R	14%					14%	14%			
Dr Peter Hornby	A	25%					11%	11%			14%
Dr Timothy McConachy	R	13%	13%					13%			
Dr Brent McInnes	R	13%				8%		8%			5%
Prof Hans Muhlhaus	A	20%					5%	5%			15%
Dr Alison Ord	A	85%					15%	15%			70%
Dr Joanna Parr	R	10%	10%					10%			
Paul Roberts	A	40%					16%	16%			24%
Dr Chris Ryan	R	10%	2%			3%		5%			5%
Dr Peter Schaubs	R	2%					2%	2%			
Dr John Walshe	R	15%	10%				5%	15%			
Dr Chongbin Zhao	R	18%					18%	18%			
Total		309%	40%	0%	0%	11%	115%	166%	0%	0%	143%
Total Partner In-Kind Research Staff %		1994%	1173%	79%	173%	156%	140%	1721%	39%	0%	234%
Other Particpants											
Dr Nick Fox, Dr Roric Smith, Dr Anthony Coote - AngloGold	R	25%	25%					25%			
Dugi Wilson - MIM	R	5%	5%					5%			
Dr Peter Jones - MIM	R	20%	20%					20%			
Jennifer Gunter - MIM	R	5%	5%					5%			
Dr Paul Gow - MIM	R	10%	10%					10%			
Greg Hall & Other - Placer Dome	R	30%	30%					30%			
Terry Lees - Pasminco	R	36%	36%					36%			
John Rowe - MPI	R	6%	6%					6%			
Dean Frederickson - MPI	R	5%	5%					5%			
Jon Dugdale - MPI	R	24%	24%					24%			
Shane Mele - MPI	R	10%	10%					10%			
Total		176%	176%	0%	0%	0%	0%	176%	0%	0%	0%
Total In-Kind Research Staff %		2170%	1349%	79%	173%	156%	140%	1897%	39%	0%	234%
Full Time Equivalents		21.70	13.49	0.79	1.73	1.56	1.40	18.97	0.39	0.00	2.34

R = Research; E = Education; C = Commercialisation; A = Administration

CRC Funded Staff

Name	Employing Organisation	Main Activity	Total % of Time	% Spent on Research Program					Total on Research	% Spent on Program		
				Terranes	Architecture	History	Fluids	Modelling		Education	Commercial	Admin
Juanwen Yang	CODES	R	50	50					50			
Stuart Bull	CODES	R	10	10					10			
Dr Alison Ord	CSIRO	R	12	12					12			
Dr Gordon German	CSIRO	R	47	47					47			
Dr John Walshe	CSIRO	R	6	6					6			
Dr Joanna Parr	CSIRO	R	30	30					30			
Dr Klaus Gessner	CSIRO	R	100	100					100			
Misc staff	CSIRO	R	15				15		15			
Dr Peter Alt- Epping	CSIRO	R	18	6				12	18			
Dr Reem Freij-Ayoub	CSIRO	R	47	47					47			
Dr Robert Hewson	CSIRO	R	95	95					95			
Dr Thomas Cudahy	CSIRO	R	5	5					5			
Dr Art Raiche	CSIRO	R	60	60					60			
Dr Fred Sugeng	CSIRO	R	60	60					60			
Dr Dave Annetts	CSIRO	R	60	60					60			
Dr Jon Hungtington	CSIRO	R	15	15					15			
Dr Lew Whitbourn	CSIRO	R	25	25					25			
Dr Kai Yang	CSIRO	R	40	40					40			
Keith Scott	CSIRO	R	25	25					25			
Dr Mark Berman	CSIRO	R	15	15					15			
Peter Mason	CSIRO	R	10	10					10			
Phil Connor	CSIRO	R	35	35					35			
David Clark	CSIRO	R	50	50					50			
Dr Phil Schmidt	CSIRO	R	38	38					38			
Dr Fabio Boschetti	CSIRO	R	13					13	13			
Dr Yanhau Zhang	CSIRO	R	8					8	8			
Dr Chongbin Zhao	CSIRO	R	10					10	10			
Dr Barry Murphy	JCU	R	50	50					50			
Dr Bin Fu	JCU	R	25				25		25			
Misc staff	JCU	R	25	25					25			
Prof Nick Oliver	JCU	R	5	5					5			
Dr Peter Jones	JCU	R	100	100					100			
Dr Roger Mustard	JCU	R	50	25			25		50			
Maurizio Tonelli	Melb	R	50			50			50			
Terry Lees	Melb	R	33	20			13		33			
Dr Andy Wilde	Monash	R	100	100					100			
Melissa Gregory	Monash	R	100	100					100			
Jonathon Thom	Monash	R	5		5				5			
Dr Paul Duuring	Monash	R	18	18					18			
Paul Polito	Queens Uni	R	66	66					66			
Dr Peter Neumayr	UWA	R	50	50					50			
Dr Bryan Krapez	UWA	R	40	40					40			
Dr Stuart Brown	UWA	R	20	20					20			
Steve Gardol	UWA	R	20	20					20			
Total CRC Funded Staff			1,655	1,480	5	50	78	43	1,655	-	-	-

(100% = 1 person year)

Summary of Contributions in Person Years

	Total Equivalent Person Years	Person Years Spent on Research Program					Total Years on Research	Person Years Spent on Program		
		Terranes	Architecture	History	Fluids	Modelling		Education	Commercial	Admin
Total In-Kind Person Years	21.70	13.49	0.79	1.73	1.56	1.40	18.97	0.39	-	2.34
Total Cash Funded Person Years	16.55	14.80	0.05	0.50	0.78	0.43	16.55	-	-	-
Total Person Years	38.25	28.29	0.84	2.23	2.34	1.83	35.52	0.39	-	2.34
Proportion of Total Professional Staff Resources in Each Activity	100%	74%	2%	6%	6%	5%	93%	1%	0%	6%

Support Staff

Organisation	Number of Support Staff in Person Years	
	Contributed	Funded
University of Melbourne	–	0.3
Monash University	–	0.2
La Trobe University	–	0.1
James Cook University	–	0.2
University of Western Australia	–	0.2
Geoscience Australia	–	0.3
CSIRO Exploration & Mining	–	3.5
Total	–	4.8

PUBLICATIONS

Conference Papers

Blewett, R., Champion, D.C., Whitaker, A.J., Bell, B., Nicoll, M., Goleby, B.R., Cassidy, K.F., and Groenewald, P.B., June 2002. Three dimensional (3D) model of the Leonora-Laverton transect area: implications for Eastern Goldfields tectonics and mineralization. In Cassidy, K.F. (editor) GA-GSWA North Eastern Yilgarn Workshop Notes, pp. 75-91.

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Mark, G., Wilde, A.R., Oliver, N.H.S. and Williams, P.J., July 2002. Predicting alteration patterns in the outflow zones of hydrothermal ore systems: a case study using the "spent" fluids from the Ernest Henry Fe-oxide-Cu-Au deposit. In Geological Society Australia Abstracts 67, pp. 291.

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Workshop Notes

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Articles, Media Reports and Newsletters

The Age, Education Section, 11th April 2002, 'Earth scientists go digging with new tools'. Professor Andrew Gleadow (Program Coordinator) was interviewed on the "Advances in IT could spark a boom in Australian mining exploration".

Channel Nine, 1st May 2002. Dr Russell Korsch (Deputy CEO and Program Coordinator) was interviewed on the "Victorian Geotraverse" background information.

*pmd**CRC News Update, December 2001.

*pmd**CRC News Update, March 2002.

*pmd**CRC News Update, May 2002.

PUBLIC PRESENTATIONS, PUBLIC RELATIONS AND COMMUNICATION

*pmd**CRC* Public Communication 2001-02

SPEAKER/EVENT	TITLE	VENUE	DATE
Dr Bob Haydon CEO, ***pmd**CRC***	"Overview of new CRC for *predictive mineral discovery"*	University of Melbourne, School of Earth Sciences	20 July 2001
Dr Bob Haydon CEO, ***pmd**CRC***	"How can ***pmd**CRC*** maximise its impact on mineral discovery in Victoria?"	Victorian Earth Science Alliance, Melbourne	31 August 2001
pmd**CRC Booth	***pmd**CRC***	International Archaean Symposium, Perth	24 to 28 September 2001
Dr Bob Haydon CEO, ***pmd**CRC***	"Overview of ***pmd**CRC"***	PIRSA, Adelaide	23 January 2002
Dr Bob Haydon CEO, ***pmd**CRC***	*"predictive mineral discovery* CRC – Is engaging the industry enough?"	Geoscience Australia, Canberra	8 May 2002
pmd**CRC Booth	***pmd**CRC*	CRCA Conference, Sydney	21 to 23 May 2002

Table 10

Project Development Teams and Workshops

Project Development Teams, comprising representatives from industry sponsors, relevant federal and state geological institutions, and research organisations, were formed and workshops held for all terranes and enabling technologies to determine critical research issues of importance to industry in order that detailed research proposals could be prepared.

The Project Development Teams will continue to meet regularly to monitor progress and direction of research projects.

The full list of workshops including PDT workshops is tabulated below:

EVENT	VENUE / LOCATION	DATE
PDT workshop - Yilgarn 1	CSIRO, Perth	9 May 2001
PDT workshop - Curnamona BHT 1 NSW	DMR, Sydney	12 June 2001
PDT workshop - Isa Sediment hosted Cu-Zn-Pb	Qld DNR&M, Brisbane	12 June 2001
PDT workshop - Isa IOCG	Qld DNR&M, Brisbane	12 July 2001
PDT workshop - Yilgarn 2	CSIRO, Perth	31 July 2001
PDT workshop - Curnamona BHT 2	NSW DMR, Sydney	9 August 2001
PDT workshop - Isa Sediment hosted Cu-Zn-Pb 2	JCU, Townsville	28 August 2001
PDT workshop - Isa BHT	JCU, Townsville	29 August 2001
PDT workshop - Isa IOCG 2 ***pmd**CRC*** Modelling Workshop	JCU, Townsville CSIRO, Perth	30 August 2001 3-4 December 2001
PhD seminar (Chris Wijns)	CSIRO, Perth	11 April 2002
GA-GSWA North Eastern Yilgarn Workshop	CSIRO, Perth	20 June 2002
STEM Stage 1 Workshop	CSIRO, Perth	24 June 2002

Table 11

*pmd**CRC* Website

The ***pmd**CRC* website was developed during the year and provides the Centre's up-to-date information to the general public and secure access to participants. The website is easily accessed at www.pmdcrc.com.au and has received approximately 3000 hits since its development. The website also delivers project information, technical reports and administrative information at a secure level to partners, researchers and industry sponsors.

PERFORMANCE INDICATORS

The Performance Indicators of ***pmd****CRC* as set out in the Commonwealth Agreement are:

Objective 1: Resolve Key Areas of Uncertainty in Existing Ore Deposit Models

Assembly of multidisciplinary teams involving key stakeholders to identify and agree uncertainties:

Workshops / Seminars held during 2001-2002	Number of participants from research organisations	Number of industry participants	Date
PDT workshop - Yilgarn 1	18	13	9 May 2001
PDT workshop - Curnamona BHT 1	14	10	12 June 2001
PDT workshop Isa Sediment hosted Cu-Zn-Pb	25	13	12 June 2001
PDT workshop - Isa IOCG	20	11	12 July 2001
PDT workshop - Yilgarn 2	18	11	31 July 2001
PDT workshop - Curnamona BHT 2	18	9	9 August 2001
PDT workshop Isa Sediment hosted Cu-Zn-Pb 2	12	8	28 August 2001
PDT workshop - Isa BHT	14	9	29 August 2001
PDT workshop - Isa IOCG 2	14	8	30 August 2001
pmd*CRC* Modelling Workshop	23	10	6 December 2001
PhD seminar (Chris Wijns)	12	5	11 April 2002
GA-GSWA North Eastern Yilgarn Workshop	21	8	20 June 2002
STEM Stage 1 Workshop	6	4	24 June 2002

Evidence of contribution of data for integrated research:

Project	Contributor	Data	In-Kind Value
I2	BHP Billiton	Jimmy's Creek prospect Drill holes BMD 3,7,8,9,12,13,16 & 17 3,058m of drilling.	$250,000
I2	BHP Billiton	Naraku area 10 holes for 3,014m.	$250,000
I2	BHP Billiton	Noranda drilling at Cormorant and Middle Creek prospects. 12 drill holes for 4,200m.	$300,000
I4	MIM	Exploration Airborne magnetic and radiometric survey of the complete Mount Isa Inlier	$1,922,000 year 1
T1	DNR - GSV	Existing mapping projects in Western and Eastern Victoria. New mapping projects in Eastern Victoria. Regolith mapping program. Provision of GIS packages.	$1,277,000 for year 1
C1	Pasminco Limited	3D Model and data for Broken Hill.	$147,000
C1	Pasminco Limited	3D Model and data for Tasmania.	$100,000
C1	Pasminco Limited	Maps, Catalogue, Database, Global Literature and Library.	$200,000

Number of new robust process models constructed:

Model	Number	Comment
Isa Copper System	1	under construction
AngloGold Gold System	1	under construction

Progress towards resolving uncertainties:

2001-02
on track according to project milestones

Number of collaborative seminars/workshops:

2001-02
12

Publications:

Number of publications	2001-02
Articles, media reports and newsletters	5
Sponsor's workshop notes	1
Conference papers	7

Objective 2: Build 3D and 4D Images of Mineralising Systems

Number of airborne geophysical surveys, seismic surveys, regional geoscience surveys, isotope analyses:

2001-02
Seismic survey in Western Australia (157km)

Number and quality of 3D, 4D models constructed:

Model	Comment
Isa Valley (MIM)	under construction
Broken Hill	constructed
Western Tasmania	under construction
Yilgarn	under construction

Objective 3: Create a Computational Environment

Progress towards developing a computational modelling system:

2001-02
Modelling workshop, program and projects reviewed and refined

Number of companies, and individuals involved in using the system:

2001-02
AngloGold using prototype

Objective 4: Create a Computational and Communications System

Progress towards a commercial operational, high band width, interactive communications and modelling capacity:	2001-02
	Day 1 planning workshop

Number of companies and individuals involved in using the system:	2001-02
	AngloGold using prototype

Establishment of CRC website for communication:	Communication	2001-02
	Website launched	December 2001
	Website updates	Regular updates conducted throughout the year
	Website	'hits' 3,000 (approx)

Objective 5: Transfer concepts, skills, technologies

Representation of companies in Project Development Teams:	Number of companies represented at PDT's
	15

Number of courses for industry:	2001-02
	1 - WA Seismic Workshop

Number of graduate students and postdoctoral fellows involved in modelling:	2001-02
	6

International visitors:	Visitor	Location	Date
	Dr Yuejun Wang	CSIRO, Perth	January, 2002
	Dr Liangming Liu	Mt Isa	March, 2002
	Dr Andy Barnicoat	CSIRO, Perth	December, 2001 and March, 2002
	Professor Bjorn Jamtveit	CSIRO, Perth	February-March, 2002
	Professor Bruce Yardley	CSIRO, Perth	March, 2002
	Dr James Cleverley	CSIRO, Perth	April, 2002

Number of publications	2001-02
	Sponsor's workshop notes 1
	Conference papers 7

Quality and relevance of Research Program

Level of industry funding:

Participant	Cash	In-Kind
AMIRA Sponsors	$360,000	
AMIRA Projects	$792,840	
AngloGold	$170,000	$120,000
BHP Billiton		$800,000
MIM Exploration	$307,000	$1,945,000
Placer Dome	$144,000	$143,000
Fractal Graphics	$150,000	
Pasminco Limited		$530,000
MPI	$30,000	$56,000
Totals	**$1,953,840**	**$3,594,000**

Number of new AMIRA projects funded

2001-02
2

Involvement of Visiting Fellows:

2001-02		
Dr Yuri Shvarov	GA, Canberra	April-May, 2002

Industry involvement in and feedback from PDTs:

Number of workshops held during 2001-2002	Number of industry representatives present
9	46

Industry involvement in ERC:

ERC meetings	Number of industry representatives present (industry membership = 7)
September 2001	6
December 2001	4
March 2002	4

Technical Reports – Open File:

Quarterly	Number	Annual	Number
March 2002	2	July 2001-June 2002	11
April 2002	1		
June 2002	10		

Technical Reports – Confidential:

2

Published Refereed Journal Papers:

2001-02
Nil

Published Conference Papers/Abstracts:

2001-02
7

Invited Presentations:

Speaker	Topic	Date
Dr Yuejun Wang (Chinese Academy of Sciences, Changsha Institute of Geotectonics)	Lithosphere thinning in the North China Craton: structural-petrological evidences and preliminary numerical modelling	25 January 2002
Professor Liangming Liu (Central-South University, China)	Prediction of locations of hidden ore deposits in China	5 April 2002

Awards to CRC participants:

2001-02
Nil

Strategy for Utilisation and Commercialisation of research outputs

Number of new sponsors:	**Sponsors at July 2001**	**New sponsors at June 2002**
	5	9

Internal company reports utilising CRC outputs:
2001-02
Nil

Industry participation in new model reconstruction:
2001-02
MIM for I4
MPI for T1
AngloGold

Involvement of service companies in the CRC:
2001-02
Fractal Graphics

Growth of service companies:
2001-02
Nil

Patent Applications:
2001-02
Nil

Number of documented contributions to the discovery of ore bodies:
2001-02
Nil

Dollar value in the ground of these discoveries:
2001-02
Nil

Education and training

Number of postdoctoral fellows and visiting fellows:			
2001-02			
Dr Yuri Shvarov	GA, Canberra	April – May, 2002	

Number and quality of graduate students and graduate thesis completions:	**PhD students**	**Other post-doctoral students**	**Sources of co-funding**	**Completions**
	8	5	CSIRO, Monash University University of Melbourne UWA, James Cook University	Nil

Number of postgraduate courses and specialist training:
2001-02
Nil

Numbers of students co-supervised by non-core universities:
2001-02
Nil

Numbers of students co-supervised by non-university partners:
2001-02
2

Progress towards distance learning:
2001-02
Nil

Participation by and feedback from industry in transfer workshops:
2001-02
Project I4 - MIM
AngloGold

Collaborative Arrangements

Percentage of projects with staff from more than one institution:	2001-02
	76%
Number of projects with involvement of external collaborators:	**2001-02**
	15
Jointly authored publications:	**2001-02**
	6
Number of scientists seconded into the CRC:	**2001-02**
	Nil
Development of non-participant strategic alliances:	**2001-02**
	Nil

Resources and Budget

Adherence to project plans/budgets:	2001-02
	Refer to financials

Management Structure

Centre Administration and Management meeting requirements of the CRC:	2001-02
	First Year Review - no issues were highlighted
Board approval of budgets:	**2001-02**
	100%
AGM endorsement of Activities by Core Participants:	**2001-02**
	No AGM conducted in Year 1.
Human, commercial/financial and physical resources committed to programs:	**2001-02**
	No measure developed to date
Design, application and implementation of rigorous project management and monitoring procedures:	**2001-02**
	Rigorous project schedules developed for all projects; and initiation of decision point planning through STEM workshops.
Compliance with CRC Program requirements:	**2001-02**
	100% Compliance on time

Performance Evaluation

Milestones met according to detailed project plans:	2001-02
	Plans on track

Future Performance Measurement – Planning and Organising to Succeed

The *pmd**CRC* Strategic Plan draws heavily on the historical background of the *pmd**CRC* bid that clearly articulates the five Research Objectives of the *pmd**CRC*. These objectives are a firm basis for research design, and have been used to construct a portfolio that meets a range of stakeholder needs – hence its size and diversity. Nevertheless the ERC and the Board are acutely aware that achievement of the Objectives in themselves may not necessarily create the "fundamental shift in exploration practice and cost-effectiveness" that is sought;

There is now recognition that our "Vivid Description of Success" is a far better driver as it results in:

- Critical Success Factors
- Strategic Actions
- Key Performance Indicators

We believe that aligning the research and all our activities more closely to "Success" will necessarily achieve the five objectives; and will help us monitor current research efforts and if needed assist us to change/evolve to create a "fundamental shift".

Purpose and Vivid Description of Success

The Purpose of the predictive mineral discovery CRC is *to generate a fundamental shift in exploration practice and cost-effectiveness* by developing a vastly improved understanding of mineralising processes and a four dimensional understanding of the evolution of the geology of mineralised terranes and converting this into low-cost targeting tools.

Having described the reason for the existence of our Centre we have outlined the components of a successful Centre. Our expectation of seven years of cooperative research in the *pmd**CRC* is:

- To be a major influence in the rejuvenation of the exploration industry and be the global leader in changing the science base for discovery of superior ore deposits;
- That companies, students and scientists clamour to be part of this CRC;
- That *pmd* science and technology is central to exploration programs world-wide;
- The creation of new knowledge and technology that was not thought possible;
- That investors are making exploration the growth investment of choice;
- That this CRC is the one that everyone talks about and is a role model for best practice; and
- That we achieve breakthrough performance in project execution and delivery.

We have described this in the following terms:

"We will be a major influence in the rejuvenation of the mineral exploration industry and be the global leader in changing the science base for discovery of superior ore deposits ….. Our science and technology will be central to exploration programs world-wide …... Companies, students and researchers will clamour to be part of our centre and be part of creating new knowledge and technology that was not thought possible…… We will be the CRC that everyone talks about and a role model for best practice in project execution and delivery.

Investors will return to exploration as the growth investment of choice in the global mining industry, and Australian miners, explorers and service providers will lead the way." (ERC workshop, Aug 2001, Sydney)

Translating the Visionary Goals into Strategic Actions

We have translated this description into a plan to succeed by using each component of the "vision" to identify critical factors that drive specific actions, the results of which can be measured over the life of the Centre. The components are:

"Successful discovery"

"We will be a major influence in the rejuvenation of the mineral exploration industry and be the global leader in changing the science base for discovery of superior ore deposits….. Our science and technology will be central to exploration programs world-wide.

"Clamouring to get in"

…... Companies, students and researchers will clamour to be part of our centre and be part of creating new knowledge and technology that was not thought possible.

"Best practice role model"

…… We will be the CRC that everyone talks about and a role model for best practice in project execution and delivery.

"Investors return to exploration"

Investors will return to exploration as the growth investment of choice in the global mining industry, and Australian miners, explorers and service providers will lead the way."

Strategic Plan – "Action Plan to Succeed"

The components are rephrased and used to develop the plan attached.

1. Impact on Successful Discovery:
   - Research outcomes to reduce discovery costs and accelerate discovery rate through better targeting – i.e. reduce risk.
2. High Profile Centre:
   - High quality/innovative research;
   - Clear future science direction; and
   - Strong Education and Training program.
3. Best Practice Role Model:
   - Organisation widely known and respected for good teamwork and management:
     - Well-developed linkages amongst all partners;
     - Well-managed projects that deliver results on time; and
     - Projects that are responsive.
4. Investment of choice:
   - Early plan for utilisation of research outcomes and commercial success.

As a result of this process we will in future, and subject to approval of the CRC Program, use the "Description of Success" to drive our actions and measure the results, as set out in the following tables.

MEASURING SUCCESS

VISIONARY GOAL	*"Successful discovery"* • *To be a major influence in the rejuvenation of the exploration industry and be the global leader in changing the science base for discovery of superior ore deposits; and* • *That **pmd** science and technology is central to exploration programs world wide.*
Strategic Objective	> ***Reduce Discovery Risk Through Improved Targeting***
CRITICAL SUCCESS FACTOR	**KEY PERFORMANCE INDICATORS**
CSF 1 Increasing engagement and involvement of industry employees in research projects that utilise and develop new technologies.	1.1 Increase industry employee involvement in research projects; 1.2 Participation of industry employees in project teams and project meetings; and 1.3 Growth in direct industry funding of projects (Type I and Type III).
CSF 2 Easy access to and up-take of new technology utilising numerical process modelling.	2.1 Up-take of the modelling technologies and practices within Australian and global companies measured by number of sponsoring companies, number of 1-on-1 models and by testimonials / publications demonstrating utilisation; 2.2 Number of software licenses sold; and 2.3 Number of more advanced collaborative modelling efforts that are negotiated.
CSF 3 ***pmd**CRC* science and technology is central to exploration programs world-wide.	3.1 ***pmd**CRC* science and technology to contribute to an actual discovery of a mineable resource; 3.2 Recognition by a major mining / exploration company that the techniques developed by the ***pmd**CRC* were instrumental in a major mineral deposit discovery, some time in the period 2002 to 2010; 3.3 Visibility measured by workshop / conference attendance, research enquiries and company feedback; CRC representatives invited to present at industry meetings, economic geology conferences and to provide workshops and conferences for industry; and 3.4 Positive feedback from client surveys.
CSF 4 Strong customer focus and greatly improved understanding of the exploration process by the research community and the service sector.	4.1 Researchers understanding of exploration process and needs of industry; and 4.2 Timely delivery to industry of relevant research results in accessible formats.
CSF 5 Increasing industry success rates.	5.1 Extent of active utilisation of CRC-related science and technology in the exploration industry; 5.2 An investor community expectation that CRC-related science and technology to be incorporated in prospectuses and presentations; and 5.3 A reduction in annual cost of discovery accepted by exploration management as attributable, at least in part, to CRC-related science and technology.
CSF 6 Research outcomes that are unique / have major impact/ are innovative and contribute to the "fundamental shift".	6.1 Measurement against a model designed to create a fundamental shift; and 6.2 Change in resource distribution against key projects that reflect this emphasis.

VISIONARY GOAL	*"People clamour to get in"* • *That companies, students and scientists clamour to be part of this CRC; and* • *That we create new knowledge and technology that was not thought possible.*
Strategic Objective	> ***Develop High Quality, Innovative Research with Clear Future Science Direction and a Strong Education and Training Program.***
CRITICAL SUCCESS FACTOR	**KEY PERFORMANCE INDICATORS**
CSF 7 High impact website with interactive links to see "new knowledge not thought possible".	7.1 Website hits per annum; 7.2 Website update frequency; and 7.3 Client survey.
CSF 8 Exciting Education and Training program.	8.1 Responses to PhD top-up program; 8.2 Invitations for conference presentations; and 8.3 Number of workshops and number attending and external income from such.
CSF 9 Exciting research climate incorporating a mechanism to permit the best from anywhere to be involved in "high-quality" research.	9.1 Mechanism for Visiting Fellow selection defined and implemented; 9.2 External enquiries from researchers/non partners; 9.3 New research partners; 9.4 Acceptance by CRC Sponsors; 9.5 Acceptance of papers in external, international reputable journals; and 9.6 Invitations to present CRC results at international conferences.
CSF 10 Ability to exploit serendipity and other unexpected breakthroughs.	10.1 Number and quality of exciting new projects unanticipated at the start of the CRC.

VISIONARY GOAL	*"The best practice role model"* • *That this CRC is the one that everyone talks about and is a role model for best practice; and* • *That we achieve breakthrough performance in project execution and delivery.*
Strategic Objective	> ***Develop an Organisation that is Widely Known and Respected for Good Teamwork and Management.***
CRITICAL SUCCESS FACTOR	**KEY PERFORMANCE INDICATORS**
CSF 11 A marketing and promotion strategy that articulates superior value proposition differentiates the CRC and clearly describes what is meant by a fundamental shift.	11.1 An exciting marketing document/brochure; 11.2 New industry sponsors and industry involvement; 11.3 Resultant levels of enquiry from industry sources into available technology, via: - website hits; - anecdotal evidence; - referrals from existing industry players; and - growing sponsorship of CRC by industry, reflected in 11.4 Unified communication strategy within CRC.
CSF 12 Optimum allocation of Intellectual and Financial Resources.	12.1 Acceptance of and implementation of pro-active decision point planning in all projects; and 12.2 A measurable variation in the research program after Year 3 compared to Year 1.
CSF 13 Communication, teamwork and integration across participant groups and disciplines.	13.1 Percent of projects with researchers from more than 2 participants; 13.2 Percent of publications with multi-authored teams; 13.3 Number of publications including an industry co-author; and 13.4 Teamwork feedback questionnaire.

VISIONARY GOAL	*"Investors return"* • *That investors are making exploration the growth investment of choice.*
Strategic Objective	> ***Plan for Commercial Success.***
CRITICAL SUCCESS FACTOR	**KEY PERFORMANCE INDICATORS**
CSF 14 Increasing industry success rates.	14.1 Extent of active utilisation of CRC-related science and technology in the exploration industry; 14.2 An investor community expectation that CRC-related science and technology to be incorporated in prospectuses and presentations; and 14.3 A reduction in annual cost of discovery accepted by exploration management as attributable, at least in part, to CRC-related science and technology.
CSF 15 Research outcomes that are unique / have major impact/ are innovative and contribute to the "fundamental shift"	15.1 Progress on Day 1 planning; and 15.2 Alignment of projects against framework for delivery of fundamental shift.

FINANCIAL STATEMENTS AND BUDGET

The overall cash and in-kind received by the Centre in its first year exceeded the budget by $1,424,392. A strong response from all the core partners and from supporting participants provided the Centre with an in-kind contribution of $10,157,273, exceeding the budget by $2,093,273. This response was pleasing, given that much of the research did not commence at the beginning of the year. The generous support from the industry by contributing data sets and maps in addition to staff resources has been of great benefit to the Centre in its first year.

Cash commitments in year 1 fell short of plan. Industry cash contributions through AMIRA were $847,160 less than budgeted partly because of the lag time between completion of rolled-in AMIRA projects and full commencement of new AMIRA projects. This has been partly recouped through industry cash sponsorship that continues to grow despite the mineral industry's current economic downturn. The impact of withdrawal of major sponsor Pasminco Limited has been alleviated by increased support from MIM Exploration Pty Ltd and Placer Dome Asia Pacific Ltd. A cash grant of $200,000 from the WA State Government was not received and has been deferred to year 2. Although the overall cash commitments in the first year fell short of budget by $668,881 (11%), it is expected that much of this will be recouped by the end of year 2.

The leverage ratio of participants funding to Commonwealth funding over the seven years is targeted at 4.2:1. The first year actual funding exceeded this with a ratio of 6.8:1.

University of Melbourne contributed $286,124 in-kind capital in the form of refurbished office facilities for the Centre. This is not recorded as an asset to the CRC as it is vested in University of Melbourne under the arrangements of the Centre Agreement.

Statement of Financial Performance for the year ended 30 June 2002

	2002 $
Revenue from Ordinary Activities	
Commonwealth Grant	2,000,000
Cash Contributions from Supporting Participants and Sponsors	1,602,368
In-Kind Contributions From Supporting Participants	4,871,789
Interest Received	35,911
	8,510,068
Expenses from Ordinary Activities	
Cash Research Salary and On Costs	2,008,295
Cash Research Operating Expenses	2,088,212
In-Kind Research Expenses	10,157,273
	14,253,780
Profit (Loss) From Ordinary Activities	(5,743,712)
Accumulated Profits (Losses) at 30 June 2002	(5,743,712)

Statement of Financial Position as at 30 June 2002

	2002 $
Current Assets	
Cash (Note 2)	1,157,306
Receivables	609,012
Total Current Assets	1,766,318
Current Liabiities	
Payables	321,706
Total Current Liabilities	321,706
Net Assets	1,444,612
Researchers' Funds	
Contribution by Core Partners (Note 4)	7,188,324
Accumulated Profits (Losses)	(5,743,712)
Total Equity	1,444,612

To be read in conjunction with the notes to the financial statements

Notes to the Financial Statements

Note 1

Significant Accounting Policies

This financial report is a special purpose financial report prepared for use by the CRC Program, Directors and members of the partnership. The partnership is not a reporting entity. The financial report has been prepared on an accruals basis. The financial report has been prepared in accordance with Accounting Standards AAS1, AAS5 & AAS8, and requirements of the Commonwealth Agreement.

Income and expenditure are recorded separately from other transactions of the participants.

(a) Income Tax

*pmd*CRC* is an unincorporated Joint Venture and is defined as a Partnership for income tax purposes. The CRC is not a separate tax paying entity and has therefore not provided for income tax expense in its accounts.

(b) Commonwealth Grants

Grants made by the Commonwealth of Australia under the terms of the Cooperative Research Centres Agreement have been included as revenue from ordinary activities in the Statement of Financial Performance.

(c) In-Kind Contributions

Core Partner in-kind contributions to the Centre have been included in the Statement of Financial Performance as expenditure on behalf of the Centre. The value of in-kind contributions has been credited to the partners' equity in the Joint Venture and is included in Researchers' Funds in the Statement of Financial Position.

(d) Core Partner Contributions

The Core Partners are the owners of the joint venture and therefore their contributions to the centre are recorded as equity. Cash and in-kind contributions from core partners are recorded as Researchers' Funds in the Statement of Financial Position and are not included in Revenue from Ordinary Activities in the Statement of Financial Performance. In-kind expenditure from all participants (including core partners) is recorded in Expenses from Ordinary Activities in the Statement of Financial Performance.

(e) Intellectual Property

All project Intellectual Property is vested as provided in the Centre Agreement, and no Intellectual Property has been assigned or licensed without Commonwealth approval.

(f) Property, Plant & Equipment

Property, Plant and equipment over $20,000 are reported in the Commonwealth Tables, and ownership vested in the acquiring partner as per the Centre Agreement.

Note 2

Statement of Cash Flows for the year ended 30 June 2002

	2002 $
Cash Flows From Operating Activities	
Receipts From the Commonwealth Government	2,000,000
Other Income	1,602,368
Interest Received	35,911
GST Inflows	371,137
GST Outflows	(336,547)
Payments for Research	(4,418,403)
Net Cash Inflow (Outflow) From Operating Activities (Note 3)	(745,534)
Cash Flows From Financing Activities	
Cash Contribution From Core Partners	1,902,840
Net Cash Inflow (Outflow) From Financing Activities	1,902,840
Net Increase (Decrease) In Cash Held	1,157,306
Cash at Beginning of Financial Year	–
Cash at End of Financial Year	1,157,306

Note 3

Statement of Cash Flows Reconciliation Of Operating Profit (Loss) to Net Cash Inflow (Outflow) From Operating Activities

	2002 $
Operating Profit (Loss)	(5,743,712)
Non Cash Flows in Operating Profit (Loss)	
In-Kind Expenditure	10,157,273
In-Kind Contributions from Supporting Participants	(4,871,789)
Changes in Assets and Liabilities	
Increase (Decrease) in Payables	321,706
(Increase) Decrease in Receivables	(609,012)
Net Cash Provided by (used in) Operating Activities	(745,534)

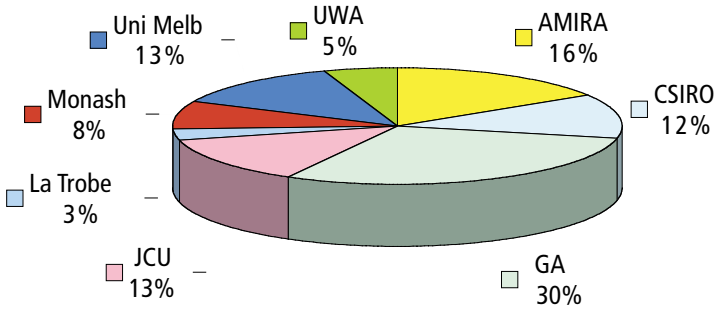
Note 4

Contribution by Core Partners	Cash 2002 $	In-Kind 2002 $	Total 2002 $
AMIRA International Limited	1,152,840	–	1,152,840
CSIRO Exploration & Mining	100,000	775,945	875,945
Geoscience Australia	100,000	2,053,853	2,153,853
James Cook University	100,000	838,810	938,810
La Trobe University	100,000	117,908	217,908
Monash University	100,000	456,379	556,379
University of Melbourne	200,000	719,371	919,371
University of Western Australia	50,000	23,218	373,218
Total	1,902,840	5,285,484	7,188,324

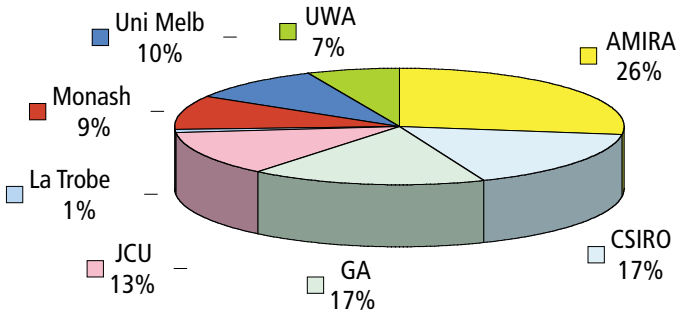
Partners' Equity Share

Partner in-kind and cash contributions are the basis for equity calculations. Partners' share in equity of the CRC is used to determine the partners' investment in Centre Intellectual Property. The following graphs show partners' share after Year 1, and an estimate based on agreed contributions over the 7 years of the Centre. The 7 Year graph has been adjusted for the retirement of La Trobe University.

Partners' Equity Share in *pmd*CRC*: Year 1 Actual



Partners' Equity Share in *pmd*CRC*: 7 Year Budget



In-Kind Contributions From Partners ($'000)

Participant	Actual Year 1 2001/2		Projected						Grand Total		
	Actual	Agr'mt	Year 2 2002/3 Agr'mt	Year 3 2003/4 Agr'mt	Year 4 2004/5 Agr'mt	Year 5 2005/6 Agr'mt	Year 6 2006/7 Agr'mt	Year 7 2007/8 Agr'mt	Total*	Agr'mt Over 7 Yrs	Diff
University of Melbourne											
Salaries	127	174	178	183	187	192	197	202	1,266	1,313	- 47
Capital	286								286	-	286
Other	306	369	369	369	369	369	369	369	2,520	2,583	- 63
Total	719	543	547	552	556	561	566	571	4,072	3,896	176
Monash University											
Salaries	203	265	265	265	265	265	265	265	1,793	1,855	- 62
Capital									-	-	-
Other	253	331	331	331	331	331	331	331	2,239	2,317	- 78
Total	456	596	596	596	596	596	596	596	4,032	4,172	- 140
La Trobe University											
Salaries	24	75	110	113	115	118	119	120	719	770	- 51
Capital									-	-	-
Other	94	239	306	313	319	325	328	331	2,016	2,161	- 145
Total	118	314	416	426	434	443	447	451	2,735	2,931	- 196
James Cook University											
Salaries	321	302	310	319	324	329	333	338	2,274	2,255	19
Capital									-	-	-
Other	518	480	492	507	515	522	529	537	3,620	3,582	38
Total	839	782	802	826	839	851	862	875	5,894	5,837	57
University of Western Australia											
Salaries	142	188	194	201	201	201	201	201	1,341	1,387	- 46
Capital									-	-	-
Other	181	238	246	254	254	254	254	254	1,697	1,754	- 57
Total	323	426	440	455	455	455	455	455	3,038	3,141	- 103
Geoscience Australia											
Salaries	487	364	364	364	364	364	364	364	2,671	2,548	123
Capital									-	-	-
Other	1,567	1,728	612	612	612	612	612	612	5,239	5,400	- 161
Total	2,054	2,092	976	976	976	976	976	976	7,910	7,948	- 38
CSIRO Exploration & Mining											
Salaries	372	546	546	546	546	546	546	546	3,648	3,822	- 174
Capital									-	-	-
Other	404	589	589	589	589	589	589	589	3,938	4,123	- 185
Total	776	1,135	1,135	1,135	1,135	1,135	1,135	1,135	7,586	7,945	- 359
Supporting Participants											
Salaries	365								365	-	365
Capital									-	-	-
Other	4,507	2,176	2,176	2,177	1,843	1,843	1,843	1,842	16,231	13,900	2,331
Total	4,872	2,176	2,176	2,177	1,843	1,843	1,843	1,842	16,596	13,900	2,696
Total In-Kind Contributions (T1)											
Salaries	2,040	1,914	1,967	1,991	2,002	2,015	2,025	2,036	14,076	13,950	126
Capital	286	-	-	-	-	-	-	-	286	-	286
Other	7,831	6,150	5,121	5,152	4,832	4,845	4,855	4,865	37,501	35,820	1,681
Total	**10,157**	**8,064**	**7,088**	**7,143**	**6,834**	**6,860**	**6,880**	**6,901**	**51,863**	**49,770**	**2,093**

*Total = "Actual" for Year 1 + Outyear "Agr'mt"

Table 12

Cash Contributions ($'000)

Participant	Actual Year 1 2001/2 Actual	Actual Year 1 2001/2 Agr'mt	Year 2 2002/3 Agr'mt	Year 3 2003/4 Agr'mt	Projected Year 4 2004/5 Agr'mt	Year 5 2005/6 Agr'mt	Year 6 2006/7 Agr'mt	Year 7 2007/8 Agr'mt	Total*	Grand Total Agr'mt Over 7 Yrs	Diff
Partners											
University of Melbourne	200	150	150	150	150	150	150	150	1,100	1,050	50
Monash University	100	100	100	100	100	100	100	100	700	700	-
La Trobe University	100	100	100	100	100	100	100	100	700	700	-
James Cook University	100	100	100	100	100	100	100	100	700	700	-
University of WA	50	50	50	50	50	50	50	50	350	350	-
Geoscience Australia	100	100	100	100	100	100	100	100	700	700	-
CSIRO	100	100	100	100	100	100	100	100	700	700	-
AMIRA	1,153	2,000	2,000	2,000	2,000	2,000	2,000	2,000	13,153	14,000	-847
Supporting Participants	1,230	1,480	1,280	1,180	1,080	1,080	1,050	1,050	7,950	8,200	-250
Total Cash From Partners	**3,133**	**4,180**	**3,980**	**3,880**	**3,780**	**3,780**	**3,750**	**3,750**	**26,053**	**27,100**	**-1,047**
Other Cash											
Sponsors	373	-	-	-	-	-	-	-	373	-	373
Interest	36	30	30	30	30	30	30	30	216	210	6
CRC Grant	2,000	2,000	3,000	3,000	3,000	3,000	2,000	2,000	18,000	18,000	-
Total Cash Contribution (T2)	**5,542**	**6,210**	**7,010**	**6,910**	**6,810**	**6,810**	**5,780**	**5,780**	**44,642**	**45,310**	**- 668**
Cash From Previous Year	-	-	1,590	331	1,030	405	232	455		4,043	
Less Unspent Balance	1,446	1,590	- 1,259	699	- 625	- 173	223	- 455	- 144	-	- 144
Total Cash Expenditure (T3)	**4,096**	**4,620**	**8,269**	**6,211**	**7,435**	**6,983**	**5,557**	**6,235**	**44,786**	**45,310**	**- 524**
Allocation of Expenditure Between Heads of Expenditure ($'000)											
Salaries	2,008	2,209	2,737	2,038	3,188	3,188	3,071	3,016	19,246	19,447	- 201
Capital		286							-	286	- 286
Other	2,088	2,125	5,532	4,173	4,247	3,795	2,486	3,219	25,540	25,577	- 37
Total Cash Expenditure	**4,096**	**4,620**	**8,269**	**6,211**	**7,435**	**6,983**	**5,557**	**6,235**	**44,786**	**45,310**	**- 524**

*Total ="Actual" for Year 1 + Outyear "Agr'mt"

Table 13

Summary of Resources Applied to Activities of Centre ($'000)

	Actual Year 1 2001/2 Actual	Actual Year 1 2001/2 Agr'mt	Year 2 2002/3 Agr'mt	Year 3 2003/4 Agr'mt	Projected Year 4 2004/5 Agr'mt	Year 5 2005/6 Agr'mt	Year 6 2006/7 Agr'mt	Year 7 2007/8 Agr'mt	Total*	Grand Total Agr'mt Over 7 Yrs	Diff
Grand Total In-Kind Exp (T1)	10,157	8,064	7,088	7,143	6,834	6,860	6,880	6,901	51,863	49,770	2,093
Grand Total Cash Exp (T3)	4,096	4,620	8,269	6,211	7,435	6,983	5,557	6,235	44,786	45,310	- 524
Total Resources Applied to Centre Activities (T1+T3)	**14,253**	**12,684**	**15,357**	**13,354**	**14,269**	**13,843**	**12,437**	**13,136**	**96,649**	**95,080**	**1,569**
Allocation of Total Resources Applied to Activities of Centre Between Heads of Expenditure											
Total Salaries (Cash & In-Kind)	4,048	4,123	4,704	4,029	5,190	5,203	5,096	5,052	33,322	33,397	- 75
Total Capital (Cash & In-Kind)	286	286	-	-	-	-	-	-	286	286	-
Total Other (Cash & In-Kind)	9,919	8,275	10,653	9,325	9,079	8,640	7,341	8,084	63,041	61,397	1,644
Total Cash & In-Kind	**14,253**	**12,684**	**15,357**	**13,354**	**14,269**	**13,843**	**12,437**	**13,136**	**96,649**	**95,080**	**1,569**

*Total = "Actual" for Year 1 + Outyear "Agr'mt"

Table 14

Allocation of Resources Between Categories of Activities

Program	Resource Usage $'000 Cash*	$'000 In-Kind	Person Years Contributed Staff	Person Years Cash Funded Staff
Research	2,551	9,023	18.97	16.55
Education	466	142	0.39	
External Communications				
Commercialisation/Tech. Transfer				
Administration	1,079	992	2.34	
Total	4,096	10,157	21.70	16.55

* Cash from all sources, including CRC Program

Table 15

Statement by Governing Board of the Centre

In the opinion of the Governing Board of the predictive mineral discovery CRC, the financial statements present fairly the sources of funding, the application of funding and the financial position of the Centre in accordance with applicable Accounting Standards, and in terms of clauses 4.1, 4.2, 5.1, 5.2, 5.3, 9.1, 9.5 and 12.2 of the Commonwealth Agreement. In particular:

1. The Researchers' contributions were made in accordance with the Budget as specified in the Agreement and their total value has equalled or exceeded the Grant. The actual cash and in-kind contributions compared to the amounts committed in the Agreement are shown in Tables 12 and 13 in the Annual Report.
2. The valuation of in-kind contributions, including the use of salary multipliers has been in accordance with that specified in the Agreement and such valuations have been made on a fair and reasonable basis.
3. The Researcher has used the Grant and Researcher's contributions only for activities of the Centre and not for any other purpose.
4. A comparison of actual and agreement expenditure by Heads of Expenditure as shown in Table 14 of the Annual Report for the 12 months to 30 June 2002, shows that the variation between actual and agreement figures is within the limits imposed by clause 5.2.
5. Intellectual Property in all Contract Material is vested as provided in the Centre Agreement and no Intellectual Property has been assigned or licensed without the prior approval of the Board and the Commonwealth.
6. Proper Accounting Standards and controls have been exercised in respect of the Grant and Researchers' contributions and income and expenditure in relation to the activities of the Centre have been recorded separately from other transactions of the Researcher.
7. The Financial Statements are drawn up to give a true and fair view of the state of affairs at 30 June 2002.

This statement is made in accordance with a resolution of the Governing Board and is signed on behalf of the Board.

Dr Mike Etheridge
Chairman, Governing Board

Dr Bob Haydon
CEO
Director, Governing Board

Dated this 18th day of September 2002.

Auditor's Report

BENJAMIN KING MONEY
CHARTERED ACCOUNTANTS BUSINESS ADVISORS

AUDITOR'S REPORT TO THE COOPERATIVE RESEARCH CENTRES PROGRAM, DEPARTMENT OF EDUCATION, SCIENCE AND TRAINING REPRESENTING THE COMMONWEALTH IN RESPECT OF PREDICTIVE MINERAL DISCOVERY COOPERATIVE RESEARCH CENTRE

FINANCIAL INFORMATION FOR THE YEAR ENDED 30 JUNE 2002

Scope

We have audited the financial information of the predictive mineral discovery Cooperative Research Centre as set out in Tables 12, 13, 14 and 15 of the Annual Report for the year ended 30 June 2002. The parties to the Cooperative Research Centre are responsible for the preparation and presentation of the financial information. We have conducted an independent audit of the financial information in order to express an opinion on it to the parties to the predictive mineral discovery Cooperative Research Centre.

The financial information has been prepared for the parties to the predictive mineral discovery Cooperative Research Centre for the purposes of fulfilling their annual reporting obligations under clause 14 (1) (f) of the Commonwealth Agreement and for distribution to the Cooperative Research Centres Program, Department of Education, Science and Training, representing the Commonwealth of Australia. We disclaim any assumption of responsibility for any reliance on this report or on the financial information to which it relates to any person other than those mentioned above, or for any purpose other than that for which it was prepared.

Our audit has been conducted in accordance with Australian Auditing Standards to provide reasonable assurance as to whether the financial information is free of material misstatement. Our procedures included examination, on a test basis, of evidence supporting the amounts and other disclosures in the financial information, and the evaluation of accounting policies and significant accounting estimates. These procedures have been undertaken to form an opinion whether, in all material respects, the financial information is presented fairly in accordance with Australian accounting concepts and standards and requirements of the Commonwealth Agreement in terms of Clauses 4, 5(1), 5(2), 5(3), 9(1), 9(5) and 12(2), so as to present a view of the sources of funding and the application of funding of the predictive mineral discovery Cooperative Research Centre and the application of which is consistent with our understanding of its financial activities during the year and its financial position.

The audit opinion expressed in this report has been formed on the above basis.

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Ian D King Paul R Money Eric M Krause
Terry T Stramotas Cameron J Watson

Audit opinion

1. The multipliers adopted by the Centre to value in-kind contributions other than salary costs have a sound and reasonable basis and each partner's component of the Researcher's Contributions for the year under report has been provided at least to the value for that year committed in the Budget as specified in the Agreement, with the following exceptions:

   Cash Contributions

Partner	Amount Contributed	Amount Committed
AMIRA International Ltd	$1,152,840	$2,000,000

   In-Kind Contributions

Partner	Amount Contributed	Amount Committed
All Partners	$5,285,484	$5,888,000

   (Refer to Table 12 of the Annual Report for details of each partners in-kind contribution levels)

   The total value of all Contributions for the year under report equalled or exceeded the amount of grant paid during the year (not including advances). [Clause 4]

2. The Researcher has used the Grant and the Researcher's Contributions for the Activities of the Centre and in my professional opinion there appear to be no material reporting irregularities. [Clause 5(1)]

3. The Researcher's allocations of the budgetary resources between Heads of Expenditure has not been lower or higher than the allocation in the budget by $100,000 or 20% (whichever is the greater amount) without prior approval by the Commonwealth. [Clause 5(2)]

4. Capital Items acquired from the Grant and Researcher's Contributions are vested as provided in the Joint Venture Agreement. [Clause 5(3)]

5. A statement signed by the Director/C.E.O., to the effect that Intellectual Property in all Contract Material is vested as provided in the Joint Venture Agreement and no Intellectual Property has been assigned or licensed without the prior approval of the Commonwealth [Clause 9(1), 9(5)], has been seen by the Auditor.

6. Proper accounting standards and controls have been exercised in respect of the Grant and Researcher's Contributions and income and expenditure in relation to the Activities of the Centre have been recorded separately from other transactions of the Researcher. [Clause 12(2)]

Benjamin King Money
Chartered Accountants

Paul R Money
Partner
Melbourne, Victoria
21 August 2002

Glossary

ACcESS	Australian Computational Earth Systems Simulator
AlOH	Aluminium hydroxide
AMIRA	Australian Minerals Industries Research Association Ltd
APAC	Australian Partnership for Advanced Computing
ARRC	Australian Resources Research Centre
ASTER	Advanced Spaceborne Thermal Emission Reflection Radiometer
BHT	Broken Hill Type
CAC	Commercialisation Advisory Committee
CGM	Centre for Global Metallogeny
CODES	Centre for Ore Deposit and Exploration Studies
CRCLEME	Cooperative Research Centre for Landscape Evolution and Mineral Exploration
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EGRU	Economic Geology Research Unit
ELFEN	A numerical modelling program owned and marketed by Rockfield Software of the UK
Encom	An Australian geophysical software and consulting company
ERC	Executive Research Committee of the ***pmd****CRC*
FASTFLO	A numerical modelling software program owned and marketed by the CSIRO Division of Mathematical and Information Sciences
FLAC	A numerical modelling program (Fast Lagrangian Analysis of Continua) owned and marketed by ITASCA
GA	Geoscience Australia
GOCAD	A 3D physical modelling package developed through the GOCAD consortium at the National School of Geology in Nancy, France
GSV	Geological Survey of Victoria
IP	Intellectual Property
IT&T	Information Technology and Telecommunications
ITASCA	US software development company (owners of FLAC)
IVEC	Interactive Virtual Environments Centre
IVMS	Interactive Visual Modelling System
JCU	James Cook University
LA-ICP-MS	Laser Ablation Inductively coupled plasma mass spectrometry
MCA	Minerals Council of Australia
MNRF	Major National Research Facility
MPI	Mining Project Investors Pty Ltd
MRT	Mineral Resources Tasmania
MTEC	Minerals Tertiary Education Council
NASA	National Aeronautics and Space Administration
NGTN	National Geoscience Teaching Network
NTGS	Northern Territory Geological Survey
PDT	Project Development Team
PIRSA	Primary Industries and Resources South Australia
PIXE	Proton induced x-ray emission
RDR	Rock Deformation Research, Leeds University
RSES	Research School of Earth Sciences, ANU
SME	Small to Medium Enterprise
SRC	Saskatchewan Research Council
SRK	Steffen, Robertson and Kirsten – an international mining industry consultancy house
STEM	Strategic Technology, Evaluation and Management
SWIR	Short wave infra-red
TMC	Tasmanian Minerals Council
USGS	US Geological Survey
UWA	University of Western Australia
VIEPS	Victorian Institute of Earth and Planetary Sciences
VPAC	Victorian Partnership for Advanced Computing
XMML	eXtended Mining Markup Language

predictive mineral discovery COOPERATIVE RESEARCH CENTRE

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