

**PRELIMINARY REPORT ON  
REVIEW OF PROJECTS  
February 2003 – Dennis Gee**

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## **INTRODUCTION**

At the August 2002 LEME Board meeting it was resolved that “the portfolio of projects be approved and that funding for the projects be endorsed for the current financial year only”. It was further resolved “that the projects be reviewed by the new CEO and be subject to further discussion by executives and the Board” at its first meeting in 2003.

The overall objective of the review is to examine whether the portfolio of projects aligns with the Strategic Plan and whether there is sufficient focus of individual projects onto the major research themes. The implication is that steps may be taken to re-scope, merge, close off existing projects or adopt new projects, in order to make for more cohesive research themes.

The review process took the form of a travelling panel consisting of Dennis Gee, Paul Wilkes and the four research Program Leaders Ravi Anand, Ken Lawrie, Colin Pain and Keith Scott, augmented by locally based executives at each node. This provided a strong focus on each project that was more effective and cheaper than having plenary workshops. The opportunity was taken to discuss programming with senior executives of core parties at each node. Comments from these discussions are included in the report. The reviews finished on 28 February 2003.

In this review there was a clear emphasis on mineral and regolith projects. Projects in Program 4 are either just commencing, or are at the generative stage, and have been formulated so as to align with the Strategic Plan. Consequently they were not reviewed in this process.

The reviews took the form of across-the-table discussions between the Project Leader (and any one else that was relevant) and the panel, and addressed:

- original objectives and scope
- work done to date
- significant results to date
- have outputs and milestones been achieved
- current scientific status
- budget and personnel status
- work required to complete
- contribution to strategic intent
- suggestions for new (or related) projects

## **STRATEGIC INTENT**

As projects were assessed against the Strategic Plan, it is appropriate to give a brief restatement of the fundamentals of that plan, which is now our guiding document.

LEME conducts research in the architecture and processes of the regolith in order to make mineral exploration more effective especially in areas of transported cover, and

to apply regolith science in addressing problems and solutions in natural resource management, with special emphasis in salinity remediation.

It does this in a framework of seven themes:

1. Understanding regolith processes
2. Models of regolith landscape evolution
3. Acid-sulphate soils
4. Regional exploration studies
5. Making geochemistry more effective
6. Geophysical mapping and modelling in regolith terrains
7. Salinity systems in regolith and groundwater
8. Regolith geoscience and urban Australia
9. Environmental geochemistry and the regolith

This review addressed Themes 1 to 7, and did not address the strategic question of balance between the two main streams of mineral exploration and environment. Nor does this review address the question of program structure. The current program structure is prescribed by the Commonwealth Agreement, however it does not present the ideal framework for research.

## **CURRENT PORTFOLIO OF LEME RESEARCH PROJECTS**

LEME currently has 31 formally adopted research projects in Programs 1, 2 and 3. These are shown in the “official” list in Table 1. However many of these are variously ongoing, concluding, inoperative, leaving on 16 currently active research projects.

### ***Ongoing Reporting Projects***

There are five ongoing reporting projects:

- Open file reports,
- Regolith landscape evolution volume,
- 3-D mapping volume,
- Atlases and manuals,
- Regolith expressions of ore systems

Some of these are hangovers from LEME1 and have passed their scheduled completion dates. However the manuals are all well advanced. It is essential that these projects be brought to completion, as the products will be widely recognised as LEME “showcases”. Steps have been taken to progressively put some material on the LEME Website – for example - finished case studies of the “Regolith Expressions of Australian Ore Systems”.

### ***Inoperative Projects***

Three projects are inoperative for various reasons:

- Northern Australian Landscape Study

- Striker Resources
- Perth cities project

These should be abandoned or re-scoped where necessary. There are no budgeted operating costs for these projects.

### ***Terminating Projects***

A further nine projects are due for completion at the end of f/y 2003:

- Harris Greenstone
- South Australian regolith
- Regional seepage geochemistry
- AEM Gawler Craton
- Pilbara manganese
- Yilgarn laterite geochemistry
- Mineral Hill regolith profiles
- Pacrim2 AIRSAR
- Dominion Challenger

Most of these projects have been relevant to our research priorities, and have generated new techniques or new information. Some projects have raised new questions, and there are requests from Project Leaders to extend them to their logical conclusions. However, the Executive believes it is important that all these projects be closed on schedule, with the best available nominated deliverables. If there are any outstanding research matters they can be incorporated into newly scoped projects.

Steps are being taken to quantify the size of unspent operating funds at the conclusion of these projects. Many of these terminating projects will provide good material for LEME News.

### ***Currently Active Projects***

This leaves 15 active core projects in Programs 1, 2 and 3, as summarised in Table 2. Thirteen of these are minerals oriented.

Two AMIRA proposals are in negotiation – hydrothermal alteration signatures in the regolith, and formation of geochemical anomalies in transported regolith.

## **COMMENTS ON CORE PORTFOLIO OF MINERAL PROJECTS**

The current core portfolio of 13 projects is a mixture of single-focus technology-development projects and broad multi-disciplinary multi-participant projects. Overall the review shows that the portfolio does not address adequately the adopted research themes.

Three of our core participants (GA, PIRSA NSWDMR), who provide large sums of operating funding by way of real cash or “in-kind services”, emphasise they prefer a

multidisciplinary systems approach with a regional focus, seeking to enhance the mineral prospectivity of mineral regions. This does not imply they require LEME to undertake regional studies, but they see it as a mechanism for focussing multiple disciplines on a strategically important area.

The multi-disciplinary multi-party projects, (**mega projects**), have strong elements of data gathering, technique development and regional prospectivity enhancement, much of which is specifically required by PIRSA and NSW DMR as part of their mandate. These projects are developing sound terrain evaluation techniques, but at this stage there is no emerging scientific break-throughs in exploration geochemistry.

Some of the regionally oriented projects carry a risk of drifting into a **service** mode. For example Western NSW Regolith entails the production of up to 20 standard scale (1:25k) regolith landform maps. All parties agree that LEME should not be in the business of standard-series production, and that the regolith-landform mapping component should be considered, either a demonstration project to be taken up by the appropriate agency if required, or a framework for other site studies.

The geophysical projects can all be described as **technique-development** in nature, and are being done outside the mainstream of LEME research. Ideally such projects should be brought into the fold of mega-projects, so that software and equipment development can be done on sites studied by other LEME projects. This will enable comparative methods to be evaluated on standardised sites. If this is not possible, then at least more regolith geology needs to be injected into these developmental projects. There is not sufficient liaison between the researchers in the four geophysical projects.

The two geochronology projects have potential to make outstanding advances in the dating of regolith processes, particularly in the time period in which ferricrete, silcrete and calcrete formed (50 – 2Ma). This research will therefore clearly make an impact on the challenge of 4-D regolith architecture. There is good liaison between Pillans (1.1) and Nemchin (1.8). Ideally the new techniques should be developed using material from areas subject to other facets of regolith studies.

Whereas some progress is being made in the 2-D rapid mapping of regolith terrains, and logging techniques, we are still some well short of developing rapid and economic methods for 3-D mapping on regions the size of mineral fields and major catchments. Drilling still remains essential for 3-D mapping. In short, we are still not integrating our geophysics and mapping.

There are only a few projects specifically directed to our major mineral exploration challenge of LEME2 – that of **making geochemistry work through transported regolith**. As yet there is no strong focus on this core area of business. Some aspects of Girilambone address transported regimes. The Mineral Hosts project is delivering intriguing and useful information on the partition of elements in weathering mineral phases. The proposed AMIRA P778 will go some way to redressing this.

In terms of the full spectrum of regolith geoscience, there is surprisingly no core project on gold in the Yilgarn. At least one major project needs to be developed here, on the transported regimes that have received little attention so far.

Another major gap in the current portfolio is the absence of research into the theoretical and experimental controls of chemical process in the regolith, such as gold and metal geochemistry in saline groundwater, predictive models involving water-regolith reactions, and the role of biota.

At the conclusion of the terminating projects, the only **industry projects** will be AMIRA 407b and P618. The latter, addressing isotopic signatures of buried basal deposits in transported regolith, is a well conceived project, but at the ultra-low levels of detection required for this fingerprinting method, the development is running into technical difficulties due to contamination from scrap metals in the environment. Two other AMIRA projects P778 and P779 are in circulation with initial meetings scheduled for May 2003.

## **MANAGEMENT CONSIDERATIONS**

### ***Mega-projects***

It may be argued that there are too many small projects in the LEME portfolio, however this is not necessarily an impediment to focussed research. In fact from the management viewpoint, it is best to have small projects as accounting entities, especially if they are scattered in different organisations, and field regions. The relevant question is whether small projects are contributing effectively to larger multi-disciplinary projects. In fact if we move to mega-projects with individual modular projects, then those modules may still need to be called projects, and have their own budgets.

### ***Budgeting and cost controls***

The review has highlighted gross underspending of operating costs relative to the approved budget, as shown for the 13 core projects in Table 2. This arises for two reasons. Firstly project leaders have not been through a realistic and thoughtful cost estimation process in the budget preparation phase, but seem to have simply “plucked numbers out of the air”. Secondly the problem is exacerbated by continuing delays in submitting and processing invoices. However the accrual register is beginning to track the commitments.

There are likely to be large surpluses at the end of this F/Y, which can be redeployed into continuing, re-scoped or new projects. A priority task for April 2003 is for Program and Project Leaders to undertake a rigorous re-forecasting of cost for the remainder of the FY02/03, for both the terminating and continuing projects.

### ***In-kind staff***

In the staff schedules of the current budget, there is the equivalent of 7.25 FTEs in under-utilised in-kind staff, mostly located at CSIRO, ANU and AU. These are tucked away in the project called *program costs* (better called project generation?). When the terminating projects are finished, a further 3.15 FTS will be freed up, allowing 10.4 FTEs to be deployed on new or continuing projects.

## **CORE PARTY INTERESTS**

### ***CSIRO***

CSIRO is the core strength of LEME in terms of analytical facility and in-kind contribution, and needs to keep these assets fully occupied. LEME will need to continue with themes such as geochemical anomaly formation, 3-D architecture and visualisation, and geochemical datasets. Exploration and Mining Division have always pursued a multi-disciplinary approach to projects wherever possible, and has strong liaisons with industry, and has preferentially sought external funding. CEM division of CSIRO, as well as LEME need to address the dwindling availability of exploration industry funds. Also CSIRO still needs to address the question of the relationship of the EM and LW divisions within LEME.

### ***Curtin University***

Curtin interests lie in geophysics, isotope geology, sedimentology and regolith geology. Like the other universities, virtually all of the in-kind and cash-funded staff commitments to LEME are taken up by supervision of Honours and PhD students. Whereas this makes a strong contribution to regolith science, it does isolate these staff from operational roles in multi-party projects.

### ***PIRSA***

PIRSA gave notice that following an internal strategic planning workshop and a Gawler Craton workshop with GA and AU, their mineral prospectivity enhancement program project (including all regolith projects) would focus on the Central Gawler Craton, and the Curnamona Craton. A \$4m AEM survey is being planned by GA over the Central Gawler project area, and the regolith program would use some or all of the following strategies to help develop an effective exploration strategy, primarily for gold:

- map contemporary landscape forms and processes
- map the 3-D volume of the regolith
- reconstruct landscape history
- model past and present physical dispersion processes
- prioritising and ranking anomalies- especially in calcrete
- map distribution of metals and major ion solutes within 3-D regolith
- map groundwater chemistry and flow regimes
- model past and present dispersion processes.

It is uncertain whether \$4m is available for an AEM survey over the central Gawler.

PIRSA plans significant expenditures of up to 7.5FTEs, plus “operational cash in kind” to the total value of more that \$1m. They would like LEME to join in these projects. GA will look to incorporating a baseline geochemical survey in priority areas in SA.]

## **Adelaide University**

Adelaide has strength in geophysical technology development - mainly software - and wish this continue. Two new LEME cash-funded positions are filled but currently are under deployed. There is enthusiasm in Adelaide for Sr isotope studies on calcrete (Barovich), interpretation of airborne gravity (John Joseph), and regolith mapping (Steve Hill)

A strong recurring theme in South Australia is the need for a **gold in calcrete project**, looking at formation of pedogenic and groundwater calcrete, how gold travels through and is trapped in calcrete, the form of gold in mineral sites, and the role of biota.

## **Geoscience Australia**

In regard to mineral programs, GA, who operate in the States/Territories under the National Geoscience Agreement, requires integrated “systems” projects of large impact involving multiple disciplines and multiple parties. Under these conditions GA would link all their regolith programs with LEME.

## **ANU**

ANU is keen to participate in multi-disciplinary multi-party studies, and can contribute their specialist expertise in the three areas:

- Gold (and Cu-Zn) geochemistry in groundwater and hypersaline brines, how gold exists in the solid phase in regolith, adsorption of gold by organic matter, up-ward physical transport of gold, and gold uptake in plants (Bear McPhail).
- Continental scale history of aridity, to give a broad context to regolith dynamics over the period from Cretaceous to Holocene – in effect a “process” sequel to P1.11. (John Chappelle)
- Geochronological dating – ongoing project (Brad Pillans)

## **NSW DMR**

NSW DMR has an ongoing commitment to LEME, and wish to have the Broken Hill and Girilambone projects brought to their scheduled finish. They believe that future work should concentrate on depositional areas of regolith, and this emphasis is driven by a northward move from Girilambone to buried terrains around Bourke. They regard regolith-landform maps as experimental prototypes (“suck and see”), and one of many layers in the GIS spatial database, of equal standing to classical surface geology maps. These products need to receive the full assessment by mineral explorers and land managers.



## **TOWARD COHESIVE AND FOCUSED RESEARCH**

### ***Criteria for project adoption***

The review panel felt a strong sentiment for a set of criteria for the adoption of new projects, so that new proposals must:

- relate to regolith
- be a multi-agency and multi-disciplinary project, or a single-focus modular project that contributes to such a thematic project.
- go through a review and endorsement process by the Executive
- should advance regolith science, or contribute solutions to land management problems

### ***Regionally clustered projects***

A successful and productive way to focus multi-disciplinary and multi-party research in Programs 1 and 2 is to develop regionally based thematic projects, where specific modules of specialist research can be plugged into regional frameworks which provide clusters of mineralised sites for detailed study. Thus all the research themes could be brought to bear on the single region. Individual project within a cluster could transgress themes.

Examples of regions include Central Gawler Gold Province, Curnamona Craton, Yandal Belt, Mt Keith Belt.

In this model individual modules would rate as single projects in the accounting and management sense. Each one of these modular projects could have their own Project Leader, but the overall cluster project will require a coordinator, who could be a Program Leader.

Some individual projects will apply to several regional clusters – for example *Objective Logging*, *Mineral Hosts* and *Regolith Dating*. Similarly, other projects of a developmental nature will not fit neatly into a regional cluster, but would stand alone as an entity.

A skeletal outline of future projects under the cluster model is shown in Table 3. Obviously this will need further discussion by Executive, and be filled in during the FY03/04 Budget preparation process.

## **PROJECT RECASTING IN THE 2003/04 BUDGET**

As noted above nine projects with attached unspent operating costs will finish this financial year. These require rigorous and realistic forecasting.

Of the 13 on-going projects in Table 2, most will endure in some form through to 2003/04. Following the strategic review by PIRSA, some projects are likely to be re-scoped. For example P1.4 (SA Sediments) probably will be carved divided in to separate Central Gawler and Olary Curnamona projects.

In addition there will be new projects commencing in FY 03/04.

It is therefore appropriate to close of the FY02/03 Budget for all projects, without any carry-overs, and prepare new operating budgets and work programs as part of the FY03/04 budget process. Implicit in this action is that work for ongoing projects identified in Table 2 will continue uninterrupted, because adequate funding can be assured.

This review highlights a need to move toward a system of monthly forecasting of operating budgets.

## **OTHER MATTERS**

This review has raised a number of issues relating to Student scholarships, education and training, communication, and promotion. It is intended to review these aspects separately.

## **CONCLUSIONS AND RECOMMENDATIONS**

1. Ongoing reporting projects (manuals) are well behind schedule, but must be finished. Some Web release is happening.
2. Nine projects scheduled to finish this F/Y should actually finish, and outstanding work and unspent funds be rolled into other projects.
3. There are **only 15 active minerals projects**, which will make project re-scoping relatively easy
4. As yet there is insufficient focus on the strategic imperative of making **geochemistry work through transported regolith**.
5. There is little current work on **processes** in the regolith (hydrochemical, isotope fingerprinting) despite our excellent capability.
6. There is **no major gold project** in Western Australia
7. The definition of a project should be an accounting entity.
8. There is enormous enthusiasm for multi-disciplinary multi-party mega-projects.
9. There is no managerial problem with having a large number of single projects but ideally they should bolt on to mega-projects.
10. LEME should resist technical service work, or standard-series production projects.
11. Technology development projects, should where possible, slot into mega-projects.
12. The best way to develop mega-projects is by clustering on **a regional focus**. This is a requirement of our survey-oriented participants.
13. All projects (except one) are grossly underspent in terms of operating costs, and surpluses are likely from terminating and on-going projects. Quantum??
14. By F/Y end there will be 10.4 FTEs freed up.
15. At year end, the F/Y 02/03 budget should be closed, and new properly costed budgets prepared for all projects.
16. Active steps are now being taken to scope new projects that align with the Strategic Plan. These will fill deficiencies in the portfolio, and provide the platform for new mega-projects.
17. A proforma for a model portfolio is submitted - this requires more work by Program Leaders

**Table 1 Official List of CRC LEME PROJECTS 2002-2003 – by program**

(updated 20.12.02 - SG)

## Research Themes

1. Understanding regolith processes
2. Models of regolith-landscape evolution
3. Acid sulfate soils: regolith processes and implications
4. Regional mineral exploration studies
5. Making geochemistry more effective
6. Geophysical mapping and modelling in regolith terrains
7. Salinity systems in regolith and groundwater
8. Regolith geoscience and urban Australia
9. Environmental geochemistry and the regolith

Program / Project No	Abbreviated Title	Project Leader	Type	Theme	Start / Finish
1.0	Program Costs and student projects				
1.0 & 2.0	Open File Reports	tba	Centre	All	Jul 02 - 6 yrs
1.0	Northern Aust landscape evolution scoping study	Graham Taylor	Centre	2	Jul 02 - 1 yr
1.1	Geochronology and quantitative models	Brad Pillans	Centre	1 & 2	July 01 - 3 yrs
1.2	Mineral mapping South Australia	Alan Mauger	Centre	1	Jan 02 - 3 yrs
1.3	Objective regolith logging	Ravi Anand	Centre	1 & 2	Jan 02 - 18 mths
1.4	SA Sediments	John Keeling	Centre	1 & 2	Jul 01 - 3 yrs
1.5	Processes in inland acid sulphate soils	Rob Fitzpatrick	Centre	3	Jul 02 - 5 yrs
1.6 & 2.6	Electrical and EM regolith studies	Graham Heinson	Centre	6	Jul 02 - 3 yrs
1.7	U-Pb and U-series dating	Alexander Nemchin	Centre	1 & 2	Jul 02 - 2 yrs
1.8	Mineral Hosts	Ravi Anand	Centre	1 & 5	Jul 02 - 2 yrs
1.9	Striker Resources		Industry		No work planned 02-03
1.10	PacRim2 AIRSAR	Ian Tapley	Industry	NA	Jul 01 - 2 yrs
1.11	Regolith landscape evolution volume	Ravi Anand	Centre	1 & 2	Jul 01 - 18 mths
1.12	3D mapping volume	Colin Pain	Centre	1 & 2	Jul 01 - 2 yrs
1.13	Atlases and manuals	XY Chen	Centre	1 & 2	Jul 01 - 14 mths
2.0	Program Costs and student projects				
2.0 & 1.0	Open File Reports	tba	Centre	All	Jul 02 - 6 yrs
2.1	Western NSW Regolith	Patrice de Caritat	Centre	4	Jul 01 - 3 yrs
2.2	Girilambone belt (Cobar-Bourke)	Ken McQueen	Centre	4	Sep 01 - 3 yrs
2.3	Harris Greenstone regolith geology /geochemistry SA	Malcolm Sheard	Centre	4	Jul 01 - 18 mths
2.4	South Australian regolith (SAR)	Mel Lintern	Centre	4	Jul 01 - 14 mths
2.5	NOT ALLOCATED				
1.6 & 2.6	Electrical and EM regolith studies	Graham Heinson	Centre	6	Jul 02 - 3 yrs
2.7	Regional seepage exploration geochemistry	Marian Skwarnecki	Centre	5	Jul 01 - Sep 02
2.8	3-D potential field inversions	Stewart Greenhalgh	Centre	6	Jul 02 - 3.5 yrs
2.9	NOT SUBMITTED TO BOARD				

2.10	AEM Gawler Craton Survey	David Gray	Industry	4 & 6	Jul 01 - 2 yrs
2.11	Partial leach isotope geochemistry (P618)	Geoff Denton	Industry	5	Jul 01 - 3 yrs
2.12	Dominion Challenger	David Gray	Industry	4	Jul 02 -
2.13	Pilbara Manganese - Part 1 and 2	Jayson Meyers	Industry	4	Jul 01 - 2 yrs
2.14	Base Metals - Yilgarn	Matthias Cornelius	Industry	4	Jul 02 - 6 mths
	<b>Yilgarn Laterite-geochemical atlas</b>	Matthias Cornelius	Centre	4	Dec 02 - 7 mths
2.15	Regolith at Mineral Hill	Keith Scott	Industry	4	Feb 02 - 6 mths
	<b>Mineral Hill Regolith Profiles</b>	Keith Scott	Industry Triako	4	Nov 02 - 6 mths
2.16	Regolith expression of ore systems	Charles Butt	Centre	1	Jan 01 - 2 yrs
2.17	NOT SUBMITTED TO BOARD				
2.18	NOT SUBMITTED TO BOARD				
2.19	Nifty Copper	Matthias Cornelius	Industry	?	Aug to oct 02
	<b>Rainbow Nifty</b>				Nov - Dec 02
3.0	Program Costs and student projects				
3.1	Baseline geochemistry Australia				No work planned 02-03
3.2	Salt in the regolith (recommend merge with 3.4)	Colin Pain	Centre	7	Jul 01 - 3 yrs
3.3	Salinity communications	Ken Lawrie	Centre	7	Jul 01 - ongoing
3.4	Uplands salt (recommend merge with 3.2)	John Wilford	Centre	7	Nov 01 - 3 yrs
3.5	NOT SUBMITTED TO BOARD				
3.6	Airborne EM (incl AMIRA P407B)	Jayson Meyers	Centre	6	Jul 02 - 3 yrs
3.7	Direct seismic-electric layer detection	Anton Kepic	Centre	6	Jul 02 - 3 yrs
3.8	Perth Cities project	Colin Pain	Industry	8	Mar 02 - 1 yr
3.9	NOT SUBMITTED TO BOARD				
3.10	<b>ANZ Geomorphology Conference</b>	Colin Pain	Centre	-	Sept-Oct 02 - 1 mth
4.0	Program Costs and student projects				
4.1	Salinity mapping and hazard assessment	Ken Lawrie	Industry	7	Jul 01 - 7 yrs
5.0	Program costs	Pat James			
5.1	MTEC Courses	Pat James & Ian Roach	Centre		Jul 02 - 3 yrs
5.2	NOT SUBMITTED TO BOARD				
5.3	Virtual regolith worlds	Pat James	Centre		Jul 02 - 3 yrs

**Table 2 RDG Project Review - Current Core Minerals Projects**

Project Number	Project name	Project leader	Project type	Generic type	Finish date	Op cost budget 0203	Ytd Expenditure	Comments
<b>Themes 1 &amp; 2 Regolith Processes and Models of Landscape Evolution</b>								
1.1	Geochron and quantitative models	B Pillans	centre		Jul 04	50,822	20,887	Good scientific outcomes, need integration with broader projects
1.3	Objective regolith logging	R Anand K Phang	centre		Jan 04	18,500	2,740	Promising technique developments, can be part of broad project
1.4	SA sediments	J Keeling	centre			22,168	4,110	Multi-item scatter approach, not now meeting PIRSA strategy. To be recast as two regional exploration studies: Central Gawler Gold and Olary regolith/geochem.
1.8	U-Pb U series dating	A Nemchin	centre		Jul 04	16,000	3,000	Promising scientific outcomes, need application and integration
<b>Theme 4 Regional Exploration Studies</b>								
1.2	Mineral mapping SA	A Mauger	centre		Jan 05	28,000	18,031	Rapid discriminator of residual, transported and hydrothermal terrains
2.1	Western NSW regolith	P de Caritat	centre		Jul 04	151,718	70,951	Must continue, but needs cohesion. Future of regolith maps needs decision. Shifting to hydrogeochemistry
2.2	Girilambone	K McQueen	centre		Sep 04	105,000	41,452	Good cohesive regional project with good prospectivity outcomes
<b>Theme 5 Making geochemistry more effective</b>								
1.8	Mineral hosts	R Anand	centre		Jul 04	24,500	2,010	Lots of new information, of good applicability, but need to continue with specific sites focus
2.11	AMIRA P618 p-l Pb isotopes	G Denton	industry		Jul 04	75,152	11,875	Excellent technology development concept, but encountering technical problems
<b>Theme 6 Geophysical Mapping and Modelling</b>								
1.6/2.6	Electrical and EM studies	G Heinson	centre		Jul 05	38,000	390	Closer liaison with CUT, and ideally needs integration with major project
2.8	3-D potential field inversions	S Greenhalgh	centre		Dec 05	35,000	16,546	Focus on basement is not LEME business
3.6	AEM incl AMIRA P 407b	J Meyers	centre		Jul 05	77,000	39,300	?????
3.7	Seismic-electric layer detection	A Kopic	centre		Jul 05	27,500	6,458	Simple regolith mapping technique may have commercial potential

<b>Themes 7 &amp; 8 Salinity Systems and Environmental Geochemistry</b>								
3.1	Baseline geochemistry of Aus	C Pain	centre		?	15,000	4,895	Mainly environmental project with mineral application
3.4	Upland salt	J Wilford	centre		Nov 04	56,096	21,656	Recommend merge with Salt in Regolith project
4.x	Numerous new projects	K Lawrie	agency					Reported separately by K Lawrie

**Table 3 Proforma for Model Portfolio - RDG Project Reviews Feb2003**

Cluster project	Project	Project leader	Ann op budget	Disciplines and people							
				mapping	geochem	mineralogy	geophysics	hydrogeochem	dating	isotopes	
Yilgarn gold in transported regolith	Thunderbox Au										
	Waterloo Ni										
	Mineral hosts										
Yilgarn gold in saline drainages	Lefroy or Lake Johnstone?										
	Other areas?										
Yilgarn regolith regional geochemistry	SW Yilgarn geochem datasets										
Central Gawler Gold	Lintern PhD										
	Gold in Calcrete										
	3-D modelling by AEM										
	Benchmark profiles										
Curnamona	Western NSW Regolith										
	Olary Regoliths										
Western Lachlan	Girilambone										
	Bourke depositional										

Western Victoria											
History of aridity											
Baseline geochem of Aus											
Developmental projects	AMIRA P618 p-1 isotopes										
	AMIRA P778										
	Regolith Dating										
	Objective logging										
	Electrical and EM studies										
	3-D potential field inversions										
	AEM incl AMIRA P 407b										
	Seismic-electric layer detection										