

Inquiry into greenfields mineral exploration and project development in Victoria

Submission from The University of Melbourne

(prepared by Professor Janet Hergt in consultation with colleagues from both The University of Melbourne and Monash University)

Summary

1. The initial questions companies contemplating exploration in Victoria will ask are: “Is commodity x likely to exist in Victoria?” and if so, “Where would it most likely be?” If the answer to the first question is no, they will go no further. GSV has played a critical role in providing confidence to explorers that Victoria is worth serious consideration across a range of commodities; indeed, Victoria has led Australia in some of their geoscience initiatives, receiving global recognition for their work.
2. The strategic direction of GSV has not been (and should not be) driven by specific commodities or industries. Their fundamental work on understanding the geology of Victoria is just as essential to carbon capture and storage or geothermal energy, (for example) as it is to the exploration for gold, base metals or other resources. We may not know what the key resources of the future might be (elements like gallium or indium used in solar cells?) and by the time we find out, and undertake the work necessary to locate them in this state, important opportunities will have been missed. By thoroughly describing all possible aspects of the geology of the entire state (mapping, sampling, analyzing, interpreting), GSV can provide a competitive advantage to Victoria by being able to respond quickly to any new demand. In short, GSV provides the means by which the State Government can make informed land use decisions.
3. Beyond exploration, the work conducted by GSV impacts Victoria’s ability to attract companies engaged in other areas such as mining ‘e-infrastructure’ for which Australia provides leadership and Victoria could attract greater interest (e.g., closer involvement with Victorian based technology development companies such as Intrepid Geophysics) and a social license to operate (I have been told Rio now invests more on issues related to this than exploration).
4. Further value lies in the improved understanding GSV can provide regarding our exposure to natural hazards (e.g., the Newcastle earthquake in 1989 is estimated to have caused \$4 billion in damage). This is an underestimated risk in Victoria (Victoria contains the most active tectonic region in Australia) and will be of increasing importance as new energy technologies come online, such as CO₂ storage, geothermal and tight gas, all of which have the ability to trigger potentially damaging earthquakes due to techniques employed during the reservoir stimulation process.
5. GSV, industry and the universities all conduct research and it is essential to Victoria’s future that this continues. Each usually operates at a different scale (e.g., regional scale of GSV compared with mine-scale of industry) and universities are more problem- or hypothesis-driven (How does process x work? Where should we go to investigate or test this? What new technologies might we develop to tackle the problem?). These inputs are complementary, and if managed well, can provide a virtuous circle of knowledge development. As an example, in the Gippsland Basin the development of geothermal and CO₂ storage industries will require a much deeper level of understanding of how complex systems within these basins interact. It is no longer appropriate to model oil and gas systems in isolation from ground and surface

water systems. We need to now consider the pore spaces (that contain all of these fluids – hydrocarbons, hot water for geothermal, CO₂ we are storing and potable water for agriculture) as the resource, rather than the commodities themselves. This allows the basin to be managed in an informed and intelligent way into the future. GSV holds the vast amounts of data and knowledge needed to model this complex system and the university sector can provide the sophisticated simulation and modelling infrastructure required to understand how these systems will behave through time. Collaborations of this type are not just desirable, but are a necessity if the value of resources like the Gippsland Basin/Latrobe Valley are to be maximised into the future.

6. Like Industry, earth scientists at universities have the entire planet to consider when determining where they will invest their (limited) resources. GSV can play a key role in ensuring that researchers, particularly from Victorian universities, are aware of significant questions or gaps their work has revealed, thereby providing important opportunities for university researchers to become inspired by Victorian-based geoscience problems (the example above provides an illustration of how powerful this could be for Victoria).
7. Conversely, university researchers often have an interesting question or hypothesis that requires a specific geological setting or type of sample suite to address it. A closer and deeper relationship with GSV would permit an increasing number of these (where possible) to be tackled in Victoria.
8. University students are keen to undertake relevant 'real world' projects involving government and industry and provide an important source of additional support. When employed they also carry their new knowledge and expertise directly into the workforce, maximizing the uptake of the results by Industry.
9. Victorian universities have a long history of collaboration with each other, particularly in senior level teaching and the establishment of geoscience research infrastructure. Research programs that bring them together have met with varying levels of success and a new model is eagerly sought.
10. A range of reports and submissions over the years have emphasized the need for greater research coordination and collaboration between stakeholders and a program or series of programs to bring expertise together. The State Government could provide leadership in this area by establishing a Director of a new entity (e.g., the Victorian Earth Resources Consortium?) with the role of informing all stakeholders of the existing research activity being undertaken, identifying the potential to open up new areas of collaboration, seeking out potential Industry partner interest, and ensuring results of research activities are strongly promoted. Part of this new initiative may involve co-funded positions and/or the co-location of staff, but certainly with a view to leveraging Industry and Federal Government funding (e.g., ARC Linkage Project grants).

Introduction

I would like to thank the Committee for the opportunity to provide one perspective from the Victorian University sector. Obviously I can only speak for the University of Melbourne, but will refer to other institutions where I believe I can. As this interview is being held towards the end of your information gathering process, I have taken the opportunity of reading some of the submissions and transcripts from other hearings to avoid unnecessary duplication as much as possible. That said, there are also a number of points raised by others that are worthy of reinforcement and expansion. I would like to concentrate on the terms of reference outlined in (f) and (g) as I believe these are areas in which interactions between Universities and State Government departments have provided, and can continue to provide, important benefits for industry that enhance greenfields exploration and project development in Victoria.

Why should Victorian universities be involved?

It is perhaps useful to begin by outlining why I would claim that universities in general (and Victorian universities in particular) have an important role to play. In a sense there are three broad categories here; research, teaching and community engagement.

Universities have the freedom to explore whatever research questions excite them. This means that they are able to conduct studies outside the mandate of State and Federal government departments and organisations (e.g., CSIRO, GSV, GA) in both the scope of the questions being addressed, and in the need to focus specifically on a particular region (e.g., Victoria). This is important because often, the new technologies and/or ways of improving data quality or thinking about the results, derive from unexpected sources. Sometimes they are the outcome of long term or left field programs that bubble along in the background, sometimes they arise from research projects with a completely different focus. They are nevertheless developments that can contribute to the outstanding work being conducted by other groups such as GSV.

Universities are also in an excellent position to work with the State Government to build upon existing information. For example, the exceptional knowledge of Victorian geology housed within GSV provides numerous opportunities for collaborative research projects that, in turn, deliver results beyond the original scope of the GSV remit and increase the knowledge base. In short, Universities have the freedom to undertake both 'greenfields' research, and leverage the research investments made by other organisations, both of which complement rather than duplicate research activity.

In terms of education, it is the Universities that generate skilled graduates for the workforce and, with the looming skills shortage in Industry, the importance of this role cannot be underestimated. The opportunities in Victoria for senior students to undertake industry-relevant, Victorian-based research projects (in cooperation with DPI, DSE and Industry partners) are numerous. This cooperation provides a win-win for all involved, and, as noted by Professor David Giles in his hearing, the employment of our graduates ensures the rapid uptake of new results and ideas by Industry.

For those graduates with career aspirations outside the resources sector, an education in the Earth Sciences nevertheless makes them more informed citizens and helps to correct the poor perceptions some initially have of Industry. In terms of more direct community engagement, academic staff sometimes garner more trust or respect from local communities as they are seen to be unencumbered by the possible self-interest that might be perceived of those in Industry.

Universities are free to undertake 'greenfields' research in areas outside government mandates that provide important innovation in technologies or ideas. They can also extend existing research programs conducted by Victorian-based agencies. Universities also inspire and educate the future generations of geologists heading into industry, government departments or

indeed universities, and have the potential to help alter negative community perceptions of 'Industry'.

A strong history of cooperation

There appears to be some perception that university academics are unapproachable and 1) don't work with industry enough, 2) don't work with government departments/agencies enough, and 3) don't work with each other enough. I would like to use a few examples to illustrate the outstanding levels of collaboration we have enjoyed in the past, before providing some thoughts on the talent Victoria has to draw upon and how we might shape a deeper level of cooperation into the future.

First, there is a strong history of shared tertiary education in Victoria. For 23 years the universities of Monash, Melbourne, La Trobe, and more recently Ballarat (and the University of Tasmania), under the banner of the Victorian Institute of Earth and Planetary Sciences (VIEPS) have shared expertise in senior level teaching, with students or staff moving between institutions for the delivery of particular units. A number of these short courses have also proven attractive to government and industry participants. Some courses are jointly delivered, drawing on different combinations of industry, government and university expertise.

A second component of the VIEPS cooperation has been the joint submission of ARC applications to build Victoria's research infrastructure in the Earth Sciences. Laboratories and instrumentation across Monash, Melbourne and La Trobe universities have been established over the decades, with researchers across the VIEPS consortium accessing facilities as they required them. These facilities also support collaborative research conducted with government organisations and industry partners alike.

So successful has been the VIEPS model, that 1) the ARC now requires cooperation between at least two institutions before they will fund expensive research infrastructure (when VIEPS began single-institutional bids were eligible) and 2) in 1999 the MCA established a nationwide senior-level teaching program in the geosciences (MTEC) very similar to that pioneered by VIEPS, but with a focus specifically on courses of need to the minerals industry.

It is true that the expansion of the ARC requirements, particularly the NCRIS program (including AuScope) and introduction of the MTEC program makes the achievements of VIEPS less prominent, but neither should detract from the cooperation we continue to enjoy, even if we have expanded our own perspectives and now also partner with other institutions across the country.

In terms of research, it is certainly true that universities could do more, but, like everyone else, academics are time-poor and face constantly increasing workloads. Given the breadth of research areas we are free to pursue, coupled with the small percentage of time available to undertake it, it is essential to excite academics with any proposed new collaboration. With our increasingly tight financial constraints we cannot simply hire new staff if we want to participate in a new project; to undertake research in a new area usually requires us to cease research in another. Thus, the argument needs to be compelling.

Persuasive cases for research collaboration between universities, government agencies and industry have certainly been made and, at the large scale, both Monash and Melbourne have joined with partners including GSV, GA, CSIRO and the Minerals Industry and had significant involvement in the national Predictive Minerals Discovery CRC (*pmd**CRC); indeed Melbourne hosted the CEO and his office for the duration of the program. Both universities have also actively been engaged in the AuScope program, and Melbourne continues to do so via AGOS (the Australian Geophysical Observing System). Melbourne University is currently a node of the CODES Centre of Excellence in Ore Deposits (an ARC-funded COE), collaborating with the University of Tasmania and industry partners to provide expertise in isotope geochemistry and *in situ* analysis unavailable from other stakeholders. The most recent collaboration between Melbourne and the DPI has included the CO2-CRC and has resulted in the establishment of a Chair in Geological Carbon Storage.

At the other end of the scale, one-on-one projects with industry partners (e.g., St Barbara, Oz Minerals, Snowy Hydro, De Beers) continue to form important pillars of our research activity at Melbourne, and we also enjoy excellent collaborations with GA, GSV, DSE, the NTGS, GSNSW and GSWA. In many of these cases staff spend time working alongside us in our laboratories to undertake analytical work and discuss the results. The drive to enhance the coverage and quality of Australia's geological databases, particularly in terms of isotope geochemistry and geochronology, are areas in which our expertise at Melbourne is routinely sought.

In the examples of cooperation between universities, government and industry outlined above, there have been opportunities to develop research projects for senior students and co-supervision has taken place across organisations where possible. These have provided, and continue to provide, some of our most valuable experiences in successful collaboration.

Despite these examples, it is fair to say that our collective history of research collaboration could be improved. The very large-scale programs tend to disintegrate into smaller units, often along organizational boundaries, whereas the small-scale collaborations evolve in a somewhat piecemeal manner. This is in part due to the nature of funding for projects within GSV. Often there is little scope for GSV to commit funding to external projects on an ongoing basis (e.g., commit to the 3-4 years of an ARC Linkage Project) as the funding would need to come from an initiative program that may only have two years to run. Increasing the budget for research collaborations within GSV would be one way to address this. Finding a collaborative program of the correct scope and scale that creates genuine networks across organisations will be essential and could draw upon the expertise and good will that already exists in this state.

Universities in Victoria have a long history of working closely with each other, with Industry and with State (and Federal) government organisations in both teaching and research. We can certainly do more in all respects but are hampered by competing demands on our time and budgets. The desire to work more closely together is there, but the time and funding to do so is limited and there is no mechanism to capture or coordinate our activities. Exploring ways in which we can leverage off our combined expertise in areas of mutual interest is extremely attractive.

Victoria's outstanding university-based research capabilities

As reaffirmed by the 2010 Excellence in Research for Australia exercise (ERA), the Earth Sciences research conducted in Australia's universities is outstanding. The nature of the ERA was such that it could only identify the larger concentrations of activity and only 21 of the 42 universities were even evaluated in the discipline of Earth Sciences. Of these 21 institutions, only 15 had measureable expertise in more than one of the 6 sub-disciplines assessed. Although it should be recognized that this exercise failed to capture pockets of excellent Earth Sciences research being undertaken at smaller institutions, it is noteworthy that, although a number of institutions scored at or above world standard in one or two specific areas of the Earth Sciences, Victoria boasts $\frac{1}{4}$ of the nation's broadest-based universities (Melbourne and Monash) considered to be carrying out Earth Sciences research at or above world standard. The combination of this breadth, in addition to the quality of research conducted by these institutions, is essential in addressing the increasingly interdisciplinary nature of often competing societal issues for which the Earth Sciences play a pivotal role (e.g., water vs minerals vs energy vs climate change).

Victoria has an industry-recognised geoscience teaching capability

As already noted, as a result of their discussion paper “Back from the Brink” (1998)¹, the Minerals Council of Australia took bold leadership in providing funding to support a VIEPS-like model of shared teaching across the institutions they viewed as providing solid fundamental education in the geosciences (a similar program was also established for mining engineering). Currently this program supports the collaboration between 8 universities nationwide, including both Monash and Melbourne. Each institution receives funding, including support to help defray the costs of their expensive third-year field-mapping subjects, as well as payments (based on student load) for delivering short courses identified to be of key importance to the minerals industry. Students moving between institutions to take a short course (e.g., from Melbourne to Adelaide) can apply for and receive a travel grant to help reduce the costs. The collaboration between institutions and networking provided to both staff and students, makes this program extremely successful in maintaining a focus on the minerals industry. That Industry continues to fund this program (in continuous operation since 1999) provides strong endorsement for the teaching provided by the partner universities.

A strong ‘GSV’ is essential to both industry and universities

The importance of GSV to the resources sector and the world-class standard of the work GSV has conducted over the years are points that have been made in numerous other submissions to this Inquiry (e.g., CSIRO, GA, AusIMM, MCA). A point I’d like to make is that a strong GSV is just as important to the universities as it is to industry. No tertiary institution in Victoria has the depth and breadth of knowledge GSV has regarding the geology of this state, and none would be appropriate custodians of the outstanding data they have worked so hard to acquire, assemble, store and make available to all. Similarly, none of us have the capacity or resources to carry out the regional-scale programs GSV does so very well.

As with the explorers of industry, universities rely not only on the outstanding data assembled and maintained by the State Government but also the energetic and thoughtful involvement of their staff. The passion of GSV staff in their work is infectious. Also similar to industry, universities have many other options available to them, and can take their research problems to other states or indeed overseas.

A number of the research projects we currently undertake would not be possible without the input of the phenomenal corporate knowledge embodied in those geoscientists still employed in DPI. It is therefore alarming to see the recent restructuring of GSV, with resulting loss of its international brand, key staff and the in-depth knowledge of Victorian geology that has gone with them. It will not be an easy task to rebuild this capability, particularly during the current mining boom. It is also disappointing to see important initiatives (such as the development of the 3D geological model of the state) grind to a halt and alarming to think the data management specialists are now so few. The geoscience capacity of the State Government is at a precarious stage at a time when the earth sciences discipline is central to the most pressing societal issues (e.g., dwindling resources, climate change, the search for sources of alternative energy, water, CCS).

The Government Submission

As I have noted key points of agreement with some submissions, I feel I should also raise a few points of disagreement with others. I do not know who prepared the Government submission (I could find no authorship on the document) but in my view it sells DPI’s role in resource exploration and discovery in Victoria well short. It also fails to cite important and comprehensive reviews that DPI has either commissioned or been involved in that specifically address the kinds of issues of concern to this Inquiry, or the recommendations that have previously been made.

¹ Minerals Council of Australia (1998), *Back from the Brink: Reshaping Minerals Tertiary Education*. Discussion Paper.

As I note from so many submissions (and as acknowledged by the author/s of the Government submission themselves), Industry is highly supportive of the geoscience work conducted by DPI. This alone should make it clear that at least some companies would likely have left Victoria if not for the information provided by GSV. Even where the government submission acknowledges an increase in exploration expenditure coinciding with the VIMP initiative, it then downplays the possibility that the excellent work of DPI played any role.

One implication is that the geoscience initiatives that have received funding (which I note has reduced from circa \$3 million p.a. in investment to less than half of this over the years) perhaps represent money wasted. I must assume any suggestion that this is the case is unfortunate and not the intention of the authors. The fact is that discoveries have been made on the basis of these initiatives, and these have likely returned the original State Government investment many-fold. For example, it is my understanding that the kinds of heavy minerals sands deposits currently being mined by Iluka were identified based on the results of the VIMP initiative. Quite apart from examples provided to this Inquiry in other submissions, the long-lead time from an improved understanding provided by these regional scale initiatives to the discovery and establishment of a mine (several years, as also acknowledged in other submissions) means that it is far too soon to judge the impact of more recent initiatives, such as Gold Undercover that was only completed a year or so ago.

The submission also seems to suggest that we may now have sufficient data. This fails to acknowledge that a thorough understanding of Victoria's geology (requiring ongoing investigation and data acquisition) is central to the broader sustainability and prosperity of this state. I understand the Inquiry is focused on mineral exploration and energy resources but the geology that controls where these occur and how (or whether) they might be exploited is also responsible for the location of prime agricultural land, groundwater flow, the storage of CO₂ and other environmental concerns. Thus, an important role of GSV that has been largely ignored in many of the submissions (including the Government submission) is its objective and robust documentation of Victorian geology that enables the State Government to make thoughtful and well-informed policy decisions about the development and management of *all* of the state's natural assets.

The value of geoscience lies beyond locating the next mineral deposit, and the mandate of DPI (in close cooperation with other departments) must also be to improve our holistic understanding of Victoria as a system.

What might a future model of collaboration look like?

Victoria is in a strong position to bring together a powerhouse of expertise involving the geoscience staff in State Government departments (DPI, DSE), university academic staff (and students), in partnership with each other and with Industry (in the broadest sense, not just in minerals and energy). This state also boasts state-of-the-art research infrastructure specifically directed to the Earth Sciences, much of which is located in universities and accessible to government and industry collaborators. That said, no university will cease its research outside Victoria to focus entirely on state-based projects. This needs to be recognized because it underscores the requirement for the State Government itself to maintain high calibre teams with a more Victoria-centric focus. There will always be activities that are more appropriate for one or other organization to undertake, but this should be seen as a virtuous circle, rather than series of separate activities to be undertaken in isolation.

As noted already, despite the willingness of the various stakeholders to work more closely together, the collaborations that have taken place have either been rather small, and although highly successful, perhaps a bit piecemeal. Alternatively, others have been so large that individual groups could retreat to their own silos and work on their component of the problem in isolation. With the conclusion of some of the grander programs (e.g., *pmd**CRC) nothing has been established to maintain any momentum that had been gained, nor create new lines of communication. In my view, getting the balance right, by establishing sufficient critical mass and diversity of expertise to tackle thorny questions, without being so large that

stakeholders contract into their own groups, is the toughest aspect of any future model of cooperation. Communication is also essential, and even being in different parts of the city can create impediments to the organic nature of collaborative research.

Despite our outstanding Earth Sciences expertise, research infrastructure and cooperation, the diffusion of activity means these strengths are less prominent than they might be, perhaps leading to the false perception that Victoria is weak, or lacks interest in Industry-relevant research. Since its inception in 1989, continuing through to 2006, VIEPS university partners funded a part time Director whose role was to help keep each of the partner institutions informed of the research activities being undertaken by academics elsewhere in the consortium, with the aim of fostering greater cooperation. The Director was also tasked with helping to promote the research conducted by VIEPS to external stakeholders, and explore opportunities for collaboration with State Government and Industry. In 2005 GSV, Esso Australia and BHP Billiton became Industry Associates and contributed funds to support the VIEPS Director and Secretariat. This dedicated liaison and promotional role no longer exists within VIEPS; however, by establishing a similar position within DPI (presumably within GSV) the State Government could provide leadership in this important area.

As a very small first step, one initiative (coordinated by such a director) that would provide scope for collaboration between numerous stakeholders is a project to address the 'scale gap' that currently exists in key areas of Victoria identified as of potential exploration interest or requiring further information to constrain current (competing?) interpretations. A study, or series of studies, carried out at the 1:5,000 or 1:10,000 scale involving detailed mapping, geophysics, geochemistry and geochronology could test and improve the existing 3D model for specific areas of interest, and add the fourth dimension, time. GSV has done an outstanding job at the more regional-scale, and Industry undertakes highly detailed work at the mine-scale, but research at this intermediate scale in both brownfields and greenfields domains remains open. A project of this kind would need to be coordinated by a member of GSV staff, liaising closely (and frequently) with participants in the universities (and CSIRO) with particular expertise. Regular meetings to bring this medium-sized group together to discuss progress would foster closer collaboration with the potential to generate ongoing partnerships. Funding could be either stand alone, provided by the State Government, or could take the form of an ARC Linkage Project that would leverage support from the Federal Government. Although a somewhat timid first step, this approach may provide renewed confidence that genuine and deep broad-scale collaborations can be established successfully.

A more bold, perhaps even radical model to encourage greater cooperation might be the co-location of GSV staff in university department(s), 'embedded geologists' if you will. The more natural exchange of ideas during day-to-day interactions has the potential to provide a step-change in the level of engagement between GSV and university researchers. The recent creation of a Chair in Geological Carbon Storage co-funded by DPI, the CO2CRC and University of Melbourne has led to the establishment of new research program in this area. This exciting development ushers in a new paradigm in which co-location plays a central role. Irrespective of whether an 'embedded researcher' model takes the form of a single research hub, a series of nodes, or a hub-and-spokes format, the new entity could be given prominence with a label such as the Victorian Earth Resources Consortium, with a Director to coordinate activities, ensure communication and promote outcomes, with sponsorship likely to derive from various Industry stakeholders.

In terms of the Earth Sciences in general (e.g., including water) and geosciences in particular (ie., the domain of GSV) most submissions are clear that the State Government must continue to undertake the fundamental mapping and other research required to understand Victoria's geological history (and hence prospectivity). It must also continue to update and be the custodians of geological data archives and make information publically available in accessible formats, whoever the end user might be.

GSV already provides important liaison between universities and industry, but could offer greater leadership in actively coordinating collaborative programs of mutual value and interest. Creating a new role of Director to provide State Government leadership in programs with a Victorian focus would serve this purpose. The GSV is currently under threat, with many recent staff losses together with their substantial knowledge and experience. In my view the important GSV brand needs to be reinstated and vacancies re-filled as a matter of urgency. With this renewal, there is an opportunity to take a more holistic view of the geoscience capability in the state, and create a new model of cooperation, perhaps including the co-location of researchers.

The greatest risk?

As noted in previous submissions to this Inquiry, the questions surrounding barriers to greenfields exploration, global competition to attract projects, and what possible responses could be made are not new; nor indeed are they unique to Victoria. These are vexed questions that have been raised in numerous State and National reports, and it is widely acknowledged that there is no simple solution or quick fix.

Most, if not all of the issues raised in this Inquiry were addressed in the Innovation Road Map for Victoria's Earth Resources (2006)², a document funded by DIIRD, DPI and DSE, with sponsorship from 3 Victorian Universities (Ballarat, Melbourne and Monash), CSIRO, the Minerals Council of Australia and 3 Industry partners (BHP Billiton, Origin Energy, Cement & Concrete Aggregates Australia). The project took around 9 months to complete and the level of engagement and input from across the sector was impressive. Subsequent reports have included the Earth Resources National Innovation Strategy (ERNIS) Scoping Study (2009; conducted by the Allen Consulting Group for DPI)³ and a review of the GSV in 2009 in which universities (among other stakeholders) were consulted but for which no report appears to have been released.

All of these studies have made recommendations urging the greater coordination of activities conducted by State Government staff, University staff (and students) and Industry stakeholders. The ability to harness the innovation and expertise of all partners, removing the need for each to duplicate the work of the other, has been reported as an essential (and somewhat urgent) aspect of any advance in this area.

Apart from the obvious risk of losing the highly valued expertise of GSV, that necessarily underpins everything that follows, the greatest risk to Victoria is to continue to ignore the advice it has so frequently been given.

² STEM Partnership (2006), *Innovation Road Maps for Victoria's Earth Resources*, Victorian Department of Primary Industries

³ Allen Consulting Group (2009), *Earth Resources National Innovation Strategy (ERNIS): Scoping Study*, Victorian Department of Primary Industries