Australian Geoscience Council Inc.

The Council of Earth Science Societies in Australia

AGC

AUSTRALIAN GEOSCIENCE TERTIARY EDUCATION PROFILE 2010

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SUMMARY

In 2007 in response to increasing concern amongst the member societies about the health of Tertiary geoscience education in Australia, the Australian Geoscience Council (AGC) undertook a survey of Australian universities with 'geoscience departments' to establish an Australian Geoscience Tertiary Education Profile 2007 (AGTEP 2007)[1]. Following the initial impact of the Global Financial Crisis, the resumption of the resources boom and the associated skills shortages, it is timely for the survey to be repeated and updated. AGTEP 2010 provides an up to date stocktake of Tertiary geoscience education in Australia and the general capabilities of Tertiary geoscience institutions.

The principal conclusion of this survey is that the status of geoscience and geoscience education has improved substantially over the last three years (2008-2010) with a marked growth in enrolled students and academic teaching staff reversing the decade-long decline to 2007. In the 2007 survey there had been an increase in enrolment particularly in levels 1 and 2 in some universities and this has now extended to all levels, particularly at the Honours level, and in many institutions. The situation of geoscience in Australian universities is stronger now than at any time over the past 15 years.

Seventeen universities have the capacity to teach geoscience as a major in their undergraduate programs with an additional university offering an earth science major as part of an environment degree. Of these, 6 maintain distinct geoscience schools. In the remainder, the geoscience discipline is amalgamated into schools of 'earth, geography and environmental science' or schools of 'physical sciences'. The consequence for the structure of the undergraduate majors on offer varies. Some schools have created 'geoscience degrees' from a blend of physical geography or environmental courses and traditional 'solid earth science' courses. Others have maintained a clear distinction between degree types.

Contrary to expectations arising from the 2007 survey, geoscience is still being taught as a component of 'environmental science degrees' at the Universities of Canberra and La Trobe and to a lesser extent at University of Technology Sydney. At RMIT University, an Honours course in Physics-Geophysics is offered to eligible physics or engineering students.

The extent to which course work is undertaken for the completion of an Honours degree varies slightly with institution. Eight universities participate in the Minerals Shortcourse Program at Honours underwritten by the Minerals Tertiary Education Council (MTEC). All institutions offer MSc by research, but there are several MSc degrees being offered predominantly by course work with a lesser component allowed for a dissertation or thesis. These coursework degrees are often specifically aimed at training candidates in the knowledge and techniques required for employment in industry.

In addition to normal curriculum reviews, several universities have taken specific, or are planning specific steps to meet the needs of potential employers by addressing the core skills requirements of graduates:

[1] Powell, T.G., 2008, Australian Geoscience Tertiary Education Profile 2007, www.agc.org.au/reports

- they have made (or are in the process of making) specific teaching appointments in resource geoscience

- they have remodelled courses to meet core skills requirements and the evolution of disciplines including field geology, digital geology, minerals geoscience and petroleum geoscience;

- placements in industry as part of a course of study; and

- provision of specific options and specializations in majors.

Increasingly, sharing of specialist teaching at the Honours and Masters level is becoming more common, active and systematically organized as follows:

- The national Minerals Tertiary Education Council (MTEC) program where 8 institutions teach courses into the Minerals Short Course Program;

- Three universities collaborate to deliver the MTEC Minerals Geoscience Masters program;

- The Sydney Universities Consortium of Teaching Geology and Geophysics – Honours Course Electives run by the Sydney metropolitan universities; and

- The Victorian Institute of Earth and Planetary Sciences Honours Program run by Melbourne, Latrobe, Monash and Ballarat.

Nationally, student enrolments as measured by Equivalent Full Time Student Load (EFTSL) have increased 25% over the last 3 years accelerating the level of growth recorded in AGTEP 2007 of 20% over the previous 5 years. Most universities show increases at all levels while others are static, or have decreased in enrolments at some levels.

A major difference from the previous survey has been the substantial growth in the numbers of Honours students, which have increased nationally by 73% to 265 over the period 2008- 2010 compared with the 9% decrease in the previous 5 years and the 60% decrease in the fifteen years leading up to 2007. However there is a wide variation between institutions.

There is also a wide variation in student load. The total EFTSL across all levels ranges from 53 to in excess of 350 with 12 (10 in 2007) universities having total EFTSL values above 100 and 7 (2 in 2007) universities in excess of 150 of which 2 have values above 250. There are 5 (7 in 2007) universities with values below 100 of which 1 (2 in 2007) has a value below 55.

Whereas in AGTEP 2007 it was not possible to discern any significant trends in post – graduate degrees, the addition of 3 years of data clearly shows some major changes. The output of MSc/MPhil degrees by research has declined by over 50% whilst the output of MSc degrees based on coursework has seen a dramatic increase, which appears to be accelerating – up 250% in 2010 compared with 2007.

In the five years leading up to 2007, the output of PhD degrees had remained generally static, but since 2007 there has been a decline of about 15%.

In 2010, 256 academic staff are engaged in some level of teaching of geoscience in Australian universities whilst there are a further 183 staff engaged in research with no formal teaching commitments. The numbers in 2007 were 170 and 187 respectively. The dramatic difference is dominated by significant change in reporting from the ANU following internal re-organisation. Removing the ANU, nationally there has been an increase in 22 (13%) staff engaged in teaching whilst the number of research positions has increased by 18 (13%).

Consistent with the increase in teaching positions amongst the 'geoscience' schools, there are now 8 (3 in 2007) schools with more than 12 teaching positions, 5 (12 in 2007) with 8-12 teaching positions and 4 (4 in 2007) with fewer than 8 teaching positions. The EFTSL per teaching academic ranges from below 5 to 20. There are 4 institutions below 10 (6 in 2007) 6 between 10 and 15 (7 in 2007) and 6 above 15 (3 in 2007).

The combination of teaching and research positions shows a wide range in capability between the 'geoscience' universities with 2 having in excess of 40 geoscience positions, 4 having between 30-40 positions, 3 having 20-30 positions, 6 having between 10 and 20 positions and 2 having fewer than 10 positions.

The survey shows that the Australian institutions vary widely in their viability as teaching institutions although there has been a general strengthening of 'geoscience schools' as student numbers have increased. There is evidence of considerable effort to meet the work force requirements of graduates both at the undergraduate and MSc levels. Funding pressures remain in some institutions. In others the rapid increase in student numbers, although sometimes accompanied by expansion of teaching staff, is causing an increase in teaching loads at a time of turnover of the 'baby boomer' generation of academics. The decline in PhD output must have a financial impact on departments and, if it continues, must be a concern for the long-term viability of geoscience research in Australian universities.

The question asked in the report on AGTEP 2007 remains highly pertinent: "What is the minimum economic department size that is sustainable in the longer run?" This has to have to take consideration of government funded student load, fee paying students, academic staff numbers, service teaching to other degrees, external funding for teaching and research funding. As this survey once again demonstrates these considerations vary from institution to institution and are not easily compared. This is rendered more complex by the changes in the funding arrangements for universities.

In general the position has improved substantially since 2007, but it remains a truism that a critical mass of teaching and research capability that creates a vibrant and attractive educational experience is fundamental to retaining tertiary geoscience educational opportunities in Australia. This survey shows that some larger schools with wide capability are growing from strength to strength, whilst others with lesser capability are static or reducing.

The university respondents are thanked for their active participation in this survey.

INTRODUCTION

In the early part of the last decade there was increasing concern within the geoscience community about the health of geoscience education in Australia and the demise of some earth science educational opportunities, university earth science teaching departments and staffing levels[2] [3]. In response to this concern the Australian Geoscience Council (AGC) undertook a survey in 2007 of Australian universities with a known geoscience capability to establish an Australian Geoscience Education Profile and a health check on our national national geoscience teaching capability. The results of the survey and an accompanying commentary was compiled into a report Australian Geoscience Tertiary Education Profile (AGTEP) 2007 and was released in January 2008[1].

Following the initial impact of the Global Financial Crisis and the resumption of the resources boom the industry skills shortages have re-emerged. A measure of the shortage of the geoscientist in the resources industry is the number of geoscientists working in the Australian Minerals Industry on temporary working visas - in April 2010 this was 680 of which 240 had been granted in 2009-10 (K. Tuckwell, personal communication). Given this situation and a number of initiatives by government and other institutions, it is timely for the survey to be repeated and for AGTEP to be updated. AGTEP 2010 provides an up to date stocktake of Tertiary Geoscience Education in Australia and the general capabilities of Tertiary geoscience institutions. Specifically the survey seeks to:

- Obtain an overview of the issues confronting Tertiary geoscience education at the present time including the supply of geoscience graduates;
- Determine where do we stand in regard to the various teaching departments offering geoscience;
- Ascertain where viable and comprehensive undergraduate majors are offered and the capability to support a full range of postgraduate programs;
- Determine what geoscience is being offered as part of a broader environmental or other science program and
- Obtain indications of the viability of earth science at Australian Tertiary Institutions and their capability

ISSUES FACING UNIVERSITY GEOSCIENCE IN 2007- 08

As a result of AGTEP 2007 the AGC identified the following systemic problems relating to geoscience in Australian universities at that time:

- The declining status of geoscience in Australia;

[2] Mineral Council of Australia, Back from the Brink: Reshaping Minerals Tertiary Education, MCA National Tertiary education Taskforce, MCA, Canberra 1998.
[3] National Committee for Earth Sciences, National Strategic Plan for the Geosciences, Australian Academy of Science , Canberra 2003.

- Insufficient funding of teaching in universities and the funding model;
- The lack of awareness in our secondary schools - this has to be seen in the context of the dearth of science teachers and the consequent poor engagement in secondary schools with Science, Technology, Engineering and Mathematics (STEM) which is a nationally recognized problem;
- The lack of post-graduate students and replacement of academic staff; and
- Recruitment strategies and cyclical nature of the resource industries.

The Minerals Council of Australia[4] reviewed the capability in 2008 of Australian universities in terms of teaching and research output in geophysics. For the purposes of the study a three-part classification of geophysics was adopted:

a) Skills in geological interpretation of geophysical data sets,

b) Numerical and physics-based geophysics, incorporating skills to design geophysical surveys, and develop new instruments or interpretation algorithms,

c) Solid earth geophysics, incorporating geodesy, paleomagnetism, heat-flow, seismology and fluid flow, which are fundamental to academic study of the earth and its physical processes.

This study showed that while the total number of students awarded BSc(Hons) in geophysics has increased slightly over four years to 2008, type (b) geophysics was at greatest risk in Australia. This was in part due to the general difficulty of attracting numerate students into science and engineering, as well as to the specific issue in higher education in Australia where specialist courses having small student numbers are disadvantaged by funding models regardless of national importance.

Output of graduates in geophysics was generally constrained by a reduction in the number of universities offering an undergraduate major in geophysics (down from eleven to four in a decade), and by a poor retention rate from the undergraduate major year into an Honours or equivalent year. In mineral geophysics the output and outlook gave further cause for concern due to three factors: competition from the petroleum sector which appeared to be hiring the majority of new graduates; the fact that the majority of new academic positions being created by universities were in petroleum and solid-earth geophysics; and the age profile of academic staff with specialist interests related to mineral geophysics.

NATIONAL DEVELOPMENTS SINCE 2008

In the ensuing period the Government has conducted a *Review of Australian Higher Education Final Report December 2008* – '*The Bradley Review'* and provided a budget

[4] Minerals Council of Australia Survey of Geophysics Capability in Australian Universities Report 0808/1

response " *Transforming Australia's Higher Education System*"[5] in the 2009 budget part of which had the potential to impact on the concerns of AGC. Specifically these were:

- From 2012, all Australian public universities will be funded for student places on the basis of student demand with transitional arrangements applying till then. The role of Skills Australia will be expanded to advise the Australian Government on the effectiveness of the higher education system in meeting Australia's skill needs. An independent review of the base funding levels for learning and teaching in higher education will be commissioned by the Government to ensure that funding levels remain internationally competitive and appropriate for the sector. It will also examine options for achieving a more rational and consistent sharing of costs between students and across discipline clusters. This review will report in 2011. Note this review is now in progress.

- New indexation arrangements introduced for Australian universities to help them meet the cost of quality teaching, learning and research – a key target was to assist in academic staff renewal given the aging work force

- The Tertiary Education Quality and Standards Agency (TEQSA) will oversee the development of strengthened quality assurance arrangements and protect the overall quality of the Australian higher education system. It will accredit providers, evaluate the performance of institutions and programs, encourage best practice,

These are long term measures the full effect of which will take some time to emerge.

The Government has also recently released a report *Research Skills for and Innovative Future – A Research Workforce Strategy to cover the decade to 2020*[6]*.* This report addresses the need for a strong and vibrant research workforce which it sees as paramount to Australia's future prosperity. The issues and strategies outlined are generic in nature but are particularly relevant to the geosciences in the face of the need for university staffing renewal due to aging of the workforce, the increased demand for skill professionals and decline in PhD graduates identified in this report.

As part of its schools educational initiative the Federal Government in partnership with the states is introducing a national curriculum. The Australian Curriculum, Assessment and Reporting Authority (ACARA) is overseeing the development of an Australian Curriculum from Kindergarten to Year 12, beginning with English, Mathematics, Science and History. Following extensive consultation and engagement by Australian geoscience societies, Earth and Space Sciences is identified as a learning strand up to Year 10 and Earth and Environmental Sciences has been identified nationally as a course option in Years 11/12. The National Curriculum will be progressively introduced from 2012 onwards.

Independently and prior to the Federal Government's announcement regarding the national curriculum the geoscience community had identified the need, in addition to those already being carried out by industry, to encourage high school students to be aware of careers in geoscience, and to choose science, preferably including geology, in their first year at university. An important strategy in this regard has been getting more

[5] www.deewr.gov.au/HigherEducation/Pages/TransformingAustraliasHESystem.aspx

[6] http://www.innovation.gov.au/Research/ResearchWorkforceIssues/Documents/ResearchSkillsforanInnovativeFuture.pdf

geology into school courses by helping teachers to deliver earth science and, in states like NSW, SA and Tasmania, to advocate the availability of Earth and Environmental Science (EES) courses. The introduction of an EES course at years 11 and 12 in NSW high schools in 2001 in place of a more restricted geology course has seen a significant increase (5 fold) in enrolments and shows the attraction of this way of introducing earth science in schools[7]. Two important initiatives have been developed.

Earth Sciences WA[8] (ESWA) has been developed in Western Australia with a top priority of getting geoscience into secondary schools with the introduction of new, Year 11-12 course in EES that started in 2007. The aim is ~25% schools and Year 11-12 students taking EES by 2011. It has included work on professional development for teachers and development of classroom and field materials in conjunction with the WA Curriculum Council. EES is also being introduced in Year 8-10 science courses and to enrich other Year 11-12 science courses. A key driver is the strategic importance of the resources industry in WA and willingness of key institutions to collaborate and seek resource industry funding.

The ***Teacher Earth Science Education Program (TESEP)*** was launched by the Petroleum Exploration Society of Australia, supported by some other AGC member societies and industry and government sponsors, to spark student interest in EES topics and to motivate and educate keen science teachers and raise the profile of EES in secondary schools nationally except Western Australia where ESWA is operative. It comprises 8 Professional Development workshops for science teachers who teach Years 7 to 10, to behas been presented at multiple centres in all eastern/central states and territories through the years from 2008. It started in Queensland, South Australia and the ACT and is being progressively rolled out. To the end of 2010, 52 workshops had been given in 17 locations engaging 660 teachers with the potential of reaching thousands of students. A further 60 workshops is envisaged in Stage 1. The program is delivered by professional teachers under the auspices of the Australian Science Teachers Association.

With the advent of the national curriculum it is in the geoscience profession's interests that curriculum materials are available and that training opportunities are available for teachers. In this light these initiatives assume critical importance. Once again these are long-term initiatives that will take some time to mature.

METHOD

The survey was undertaken using a questionnaire (Attachment A) updated to some extent from the 2007 questionnaire. Twenty-four university schools were identified as having some geoscience teaching or research capability. An invitation was sent to the heads of schools in February 2011 inviting them to complete the questionnaire. Following compilation of the data, a draft report was circulated to the universities in order for any amendments to be made in case of any misunderstanding of the questionnaire or in the interpretation of results. A number of amendments were received by late May.

[7] Australian Geoscience Council response to the National Science Curriculum Framing Paper February 2009. www.agc.org/submissions

[8] www.sciencewa.net.au/EarthScienceWA

The results of the questionnaire were supplemented by examination on the various university web-sites of the school structures and course options available to students. This enabled some, but not all incomplete data sets to be enhanced. Notes are provided on incomplete data sets in the Tables section.

It is difficult to compare the significance of raw student numbers from the different universities because of the variety of different courses on offer and the different value of the courses for crediting purposes. In order to normalize the figures from different universities, student numbers are expressed as "Equivalent Full Time Student Load (EFTSL)" - for a particular course this is the number of students multiplied by the proportion that that course represents a full work load in a given year or level.

The Fraction of a Full Course Load for particular courses ranges from 0.0625 to 0.25 for courses in levels 1-3 with the most common value being 0.125. Thus a total EFTSL of 50 in year 1 may correspond to 2 courses each with an EFTSL of 0.125 and an average class size of 200 whereas an EFTSL of 50 in year 3 may correspond to 9 courses each with an EFTSL of 0.125 and an average class size of 30. In the Honours year, the total EFTSL approximates the number of students since at this stage students are usually studying geoscience full-time.

The total EFTSL across all years is a measure of the total equivalent full time students undertaking geoscience courses and is also a measure of the overall educational load. It is an indicator in relative terms of financial viability of the teaching programs. Post-graduate courses are not counted here but can be important contributors to the viability of the geoscience teaching program. The average number of students per course and the number of courses taught at a particular level are also given and this also gives an indicator of the overall teaching load. The sum of the average course size across the years approximates the total number of individual students engaged in geoscience.

The results are presented in the following Tables located at the rear of this report.

Table 1 Earth science degrees offered by Australian universities

Table 2 Earth science courses offered at levels 1-3 in Australian universities

Table 3 Minerals geoscience courses sponsored at Honours and Masters Levels by Minerals Council of Australia (Minerals Tertiary Education Council)

Table 4 A profile of capability at Australian universities to supervise geoscience theses for Honours and higher degrees.

Table 5 Enrolment data for undergraduate geoscience courses at Australian universities in the period 2008-2010

Table 6 Completed post-graduate degrees in earth science at Australian universities for the period 2008-2010.

Table 7 Teaching and research positions in earth science at Australian universities at start of 2011.

For ease of reference the following abbreviations have been adopted in the text and figures in this report:

Adelaide or Adel'de	University of Adelaide
ANU	Australian National University, Canberra
Ballarat or Ball	University of Ballarat
Canberra or Canb'a	University of Canberra
Curtin	Curtin University, Perth
Flinders	Flinders University, Adelaide
JCU	James Cook University, Townsville
La Trobe	La Trobe University, Melbourne
Macquarie or M'quarie	Macquarie University, Sydney
Melbourne or Melb	University of Melbourne
Monash	Monash University, Melbourne
Newcastle or Newc'le	University of Newcastle
QUT	Queensland University of Technology, Brisbane
RMIT	RMIT University, Melbourne
Sydney	University of Sydney
Tasmania	University of Tasmania, Hobart
UNE	University of New England, Armidale
UNSW	University of New South Wales, Sydney
Queensland or Q'sland	University of Queensland, Brisbane
UTS	University of Technology Sydney
UWA	University of Western Australia, Perth
Wollongong or Woll'g	University of Wollongong

RESULTS

Institutional Status of Geoscience

Seventeen universities have the capacity to teach geoscience as a major in their undergraduate programs (Table1).

- Adelaide, ANU, Ballarat, Curtin, JCU, Macquarie, Melbourne, Monash Newcastle, UNE, UNSW, Queensland, QUT, Sydney, Tasmania, UWA, Wollongong.

- UNE continues to offer a geoscience major through collaborative arrangements with Newcastle.

- An additional university, Flinders, offers an earth science major as part of an environmental degree.

A further three universities variously offer geoscience courses (but not as a major) as part of a general science or environmental degree.

- Canberra, La Trobe, UTS

RMIT offers an Honours degree only in Physics (Geophysics)

The position of the geoscience discipline within the university structures remains very similar to the position reported for 2007, but with reorganization of schools at Queensland and Flinders. At Queensland, the School of Earth Sciences has been created as a stand-alone entity with the refurbishment of facilities and support for new teaching initiatives. At Flinders, the School of Environment has been created incorporating in 2009 the National Centre for Groundwater Research and Training, which has led to a strengthening of earth science disciplines focused on water.

The position of the geoscience discipline in the host institution varies widely. It reflects the extent to which universities have re-organised themselves in response to their strategic setting - research university, student demand, the funding environment, and search for administrative efficiencies. Some have also taken the opportunity through amalgamation of schools to differentiate themselves by introducing flexibility into the structure of degrees particularly related to the environment and natural resource management.

Geoscience constitutes a distinct school at the ANU, Curtin, Macquarie, Monash, Queensland and Tasmania. At Melbourne the school is named "Earth Sciences" but includes ocean and atmospheric sciences. At Sydney, the school is named "Geosciences" but includes geography and environmental sciences.

In most cases, earth science constitutes a component of 'schools of earth, geography and environmental science' variously linked to 'life sciences' – Adelaide, Flinders, JCU, Newcastle, NSW, UWA, Wollongong and QUT (Table 1). In two cases, the discipline sits within schools of 'physical sciences' and 'applied sciences' – Ballarat and RMIT

Two universities have two schools dealing with geoscience: Adelaide – School of Earth and Environmental Science and School of Petroleum; Curtin – Department of Applied Geology and Department of Exploration Geophysics

Composition of Geoscience Courses in Undergraduate Majors and Honours

The structure of the undergraduate majors on offer varies with the degree of integration of courses from different disciplines (Table 1). In 2010 there has been a general simplification of available options compared with 2007. The majors offered at Adelaide, ANU, JCU, Macquarie, UNSW, Sydney, Tasmania and UWA are all based on clear themes related to particular disciplines – e g geology, geophysics, hydrogeology, environmental geoscience. Marine Science is being introduced as a major within the geoscience degrees at ANU and JCU. However in some schools the electives available make it difficult to identify pure geoscience streams. Degrees are constructed from a selection of courses particularly in year 3. At Curtin, there has been a reduction in the number of named degrees but the principle of proscribed courses has been retained. The choice of courses is also restricted for institutions offering single or perhaps two majors – Ballarat, Flinders, Melbourne, Newcastle, UQ, QUT and Wollongong.

A significant change has taken place in the structure of undergraduate degrees at Melbourne. The new generation undergraduate degrees require students to take one

quarter of their subjects outside their course (i.e. non-science such as commerce, a language, music, arts). It is no longer possible for 3rd year students to study only geology. The BSc(Hons) has been superseded by a new 2 year Master of Science (Earth Sciences). This research training stream give students the opportunity to undertake a substantive research project in a field of choice as well as a broad range of coursework subjects, including a professional tools component as a pathway to PhD study or to the workforce.

UWA will be following a similar path in 2012 with a reduction in majors and named degrees. The Geology major will be offered in the BSc. This will be followed by a 1 year Honours or 2 year Masters degree. The Geology major in 2012 will remain fundamentally the same as previously with a reduction in applied subjects (mineral and petroleum geoscience specifically) with transfer of this material to the 4th year.

The geoscience majors at Wollongong and Flinders have a strong bias to natural resource management, with water resources being characteristic of Flinders. There are significant options for environmental geoscience at JCU, Sydney, UNSW and Newcastle (Table 2).

In some of the amalgamated schools (e g. Adelaide and UWA), the "solid earth science" and "environmental and surficial science" streams are kept separate in different majors. In these and in the remaining universities, the courses in Year 3 remain dominated by the 'solid earth science' disciplines with levels of teaching in 'ore deposits' 'petroleum geoscience' and 'geophysics' varying from institution to institution.

The extent to which coursework is undertaken in the completion of the Honours year varies - ranging typically from around 25% to around 50% with subject matter requirements also varying considerably between institutions. Eight universities participate and present courses in the Minerals Shortcourse Program at Honours (Table 3) underwritten by the Minerals Tertiary Education Council (MTEC). RMIT uniquely offers an Honours degree in Applied Science (geophysics) for students with a physics/engineering major.

Several universities have undertaken specific or planning steps to meet the needs of potential employers. Apart from the major changes occurring at Melbourne and flagged for UWA, and normal curriculum reviews, several universities have made or are making changes to address the core skills requirements of graduates, such as:

- they have identified and made (or are in the process of making) specific teaching appointments in resource geoscience
  - JCU, Monash, Newcastle, Queensland (industry consultants);

- they have remodelled courses to meet core skills requirements and evolution of disciplines including field geology, digital geology, minerals geoscience, petroleum geoscience
  - Adelaide, JCU, Melbourne, Sydney, Queensland;

- placements in industry as part of a course of study
  - JCU, Newcastle, Queensland; and

- provision of specific options and specializations in majors
  - Adelaide, ANU, UWA.

Post-Graduate Degrees

All the surveyed universities offer MSc by research. There are a growing number of MSc degrees being offered predominantly by course work with a lesser component allowed for a dissertation or thesis (Table 1). As the Melbourne Model and UWA initiatives develop, MSc degrees by coursework will develop further and in the case of Melbourne will substitute for the Honours level. These degrees are often specifically aimed at training candidates in the knowledge and techniques required for employment in the resources industry. In the case of Melbourne, the aim will also be to develop the broader skills required in the workforce.

Again MTEC offers a Minerals Geoscience Masters Program at three universities aimed predominantly at candidates with some professional minerals experience (Table 3). The School of Petroleum at the University of Adelaide also has strong industry backing and offers a range of courses tailored for entry into the petroleum industry. Curtin University has a wide variety of post-graduate course options. In the case of Macquarie an MSc by coursework aimed at industry skills will be wound-up in 2012.

Each institution was asked to use the ABS Research Classification codes to identify areas where thesis topics could be supervised at Honours, Masters and Doctorate levels. These are mapped for each institution in Table 4. Note the ABS Australian and New Zealand Standard Research Classification was revised in 2008 and hence differs from that used in AGTEP 2007.

Not surprisingly the distribution of capability generally followed the teaching profile outlined above. Ten of the institutions surveyed identified themselves as having the capability to supervise theses across an almost full range of solid earth sciences (403 Geology and including the key elements of 402 Geochemistry and 403 Geophysics) with the balance of the institutions having some capabilities in particular areas and gaps in other areas.

Undergraduate Student Numbers

The long term viability of teaching departments depends upon attracting sufficient students to justify the academic staff for the teaching and thesis supervision role. In most universities academic staff with a teaching role also have a research and a research-mentoring role. The basic premise is that unless sufficient undergraduates are taking geoscience courses and generating the necessary income then it will be difficult for a university to justify maintaining a geoscience academic capability, unless there is a strong and distinct research rationale that the university is willing to support.

The most encouraging feature of this survey is the further increase in student numbers over that recorded in 2007 and, in particular, the recovery in the numbers of Honours students. Table 5 gives the Total EFTSL for the surveyed universities for the last 8 years and the main trends are illustrated in Figures 1 and 2. Taking into account the universities that were not reported in the 2007 survey, the overall number of students has increased 25% when comparing 2010 with 2007. This continues the trend observed in the last survey period when there had been a 20 % increase in student numbers in

levels 1-3 and particularly at level 2 (31%). The trend is not uniform and there have been small declines in some schools (Figure 2).

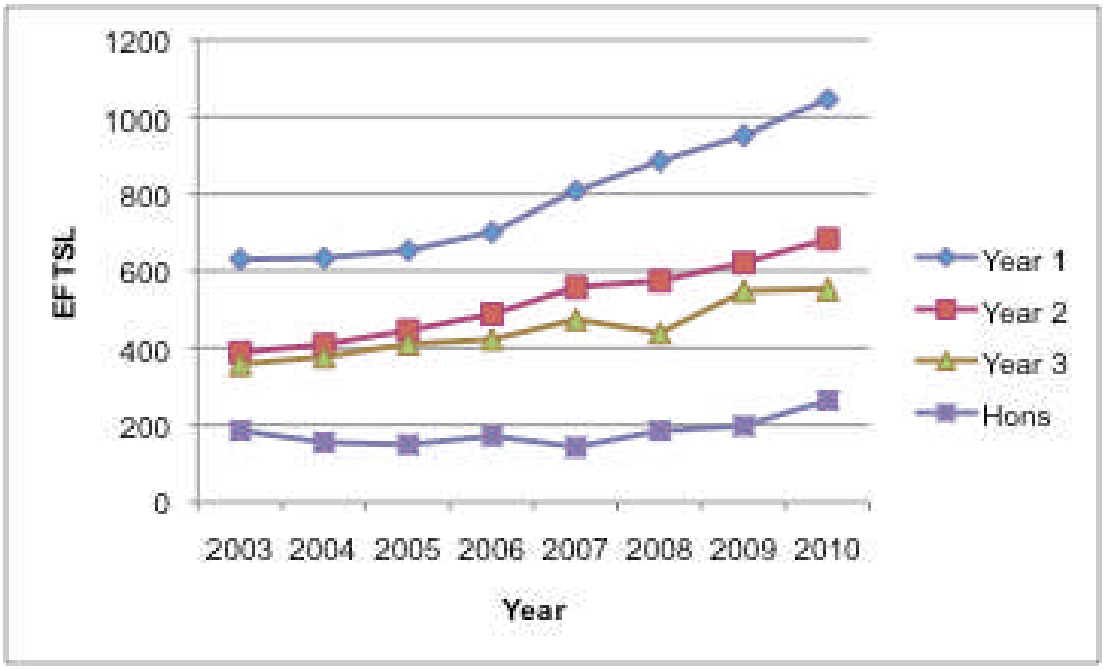


Figure 1. Trend in Equivalent Full Time Student Load (EFTSL) in geoscience at Australian universities 2003-2010.

The 2007 survey recorded a 9% decrease in Honours/Year 4 students over the 5 years prior to 2008. In contrast, the current survey of the same universities shows a 73 percent increase in Honours students over the past 3 years (see Figures 1 and 2). Again in some universities there have been small declines. The increase in Honours enrolments has been proportionately much higher than any change in the overall EFTSL. In 2010 there were nationally 265 Honours students compared with 142 at the low point in 2007.

The wide variation in student load is reflected in the total EFTSL for the 17 universities offering a geoscience major (Tables 5 and Figure 2). It ranges from 53 to more than 350 with 12 universities (10 in 2007) having total EFTSL values above 100 and 7 universities (2 in 2007) in excess of 150, of which 2 have values above 250. There are 5 universities (7 in 2007) with values below 100, of which 1 (2 in 2007) has a value below 55.

Most universities currently have large numbers of students in year 1. Comparison of the average class sizes in year 3 with the corresponding class size in year 1 two years earlier (Table 5), shows the 'retention rate' for most universities is between 15 and 25% with 3 universities below 15% and 4 universities above 25%. Adelaide has seen a dramatic increase in this retention rate from around 20% in 2007 to 45% in 2010. Similarly Curtin has seen a major change from around 30% to in excess of 40% respectively. The major metropolitan universities have large classes in year 1 and a wide range of options so that their retention rates tend to be at the lower end of the range.

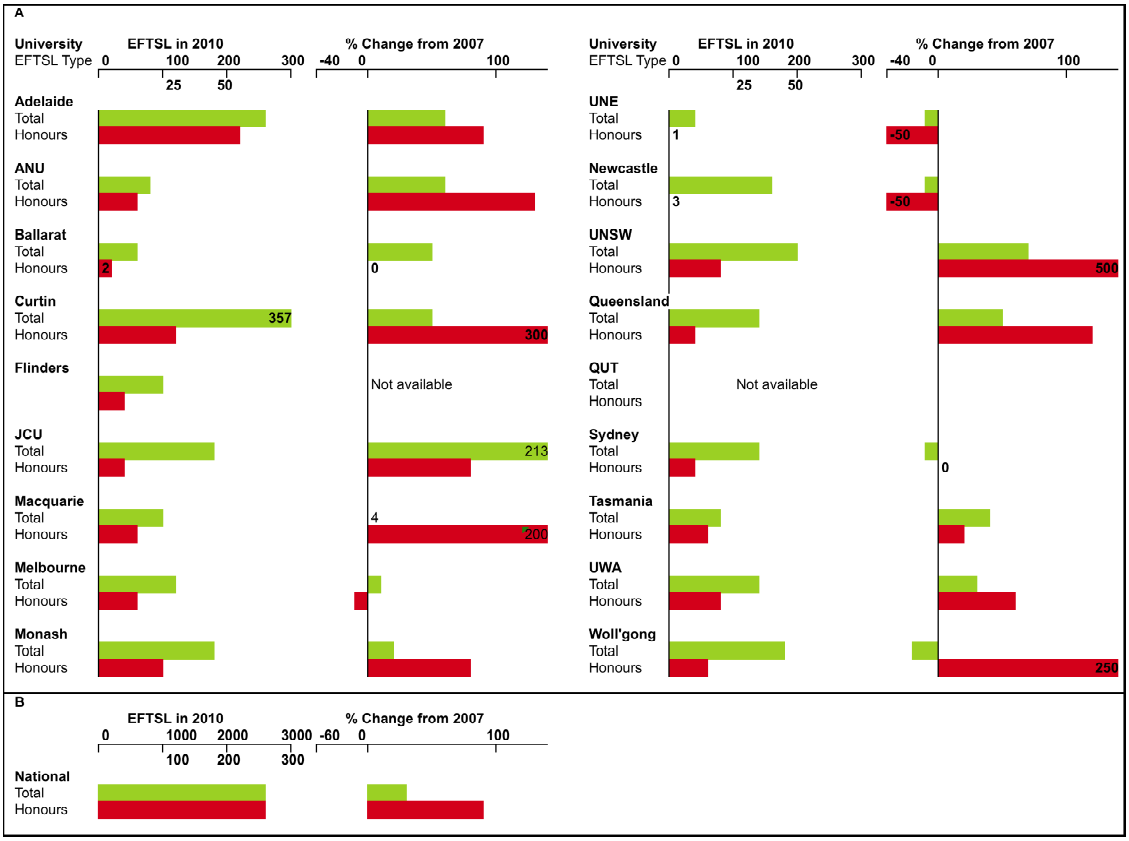


Figure 2 Total Equivalent Full Time Student Load (EFTSL) and at Honours level in geoscience at Australian universities in 2010 and % change from 2007. A. By individual university; B National total

The change in student numbers with time differs between universities (Figure 2 and Table 5). Overall, Adelaide, ANU, Ballarat , Curtin, JCU, UNE, UNSW and Queensland have shown a particularly strong increase (>40% - Figure 2). Monash, Tasmania and UWA have seen smaller increases (20-40%) whilst Macquarie, Melbourne and Sydney have been broadly static (+/- 12%). Newcastle and Wollongong have seen a decrease of more than 12%.

Similarly the change in the numbers of Honours students varies significantly. ANU, Macquarie, UNSW, Queensland and Wollongong show an increase in Honours students in 2010 by over 100% compared with the low point of 2007. Adelaide, JCU, Monash and UWA have 50-100% increases; Tasmania and Sydney have been static and UNE, Melbourne and Newcastle show a significant reduction. The decline at Melbourne is not entirely unanticipated as the transition to the Melbourne model occurs the MSc becomes the professional qualification – in 2010 there were 6 graduates by MSc coursework at Melbourne compensating for the decline at the Honours level.

In 2007, 11 of 16 geoscience schools had fewer than10 Honours students with 7 having fewer than 5. In 2010, 8 universities had 10-20 and only 3 had fewer than 10. Three universities Adelaide, Curtin and Monash had more than 20 Honours students. Between them Adelaide (55) and Curtin (32) Universities accounted for nearly a third of the 265

Honours graduates in 2010 with 20 of Curtin's graduates being in geophysics. In the latter case this is twice the number of geophysics Honours graduate recorded in the 2008 Minerals Council of Australia survey[4].

Post-Graduate Degrees Awarded

In AGTEP 2007 it was not possible to discern any significant trends in post–graduate degrees. Now the addition of 3 years of extra data clearly shows some major directions (Table 6 and Figure 3).

The output of MSc/MPhil degrees by research has declined by over 50% whilst the output of MSc degrees based on coursework has seen a corresponding increase, which appears to be accelerating. This change is mostly due to increased output at Adelaide, Curtin, Melbourne and UWA. The Melbourne increase can be attributed to the introduction of the Melbourne Model discussed above. The increases at Adelaide, Curtin and UWA are attributed to the orientation of these schools to meeting the requirement of industry and in retraining of industry personnel. JCU and Tasmania have a similar industry orientation and have had a steady output of MSc Students by coursework. The strength of this requirement for retraining can been seen by the output of Graduate and Post-Graduate Diplomas at Curtin of 20 in 2010 compared with a total of 7 in 2006 and 2007 combined.

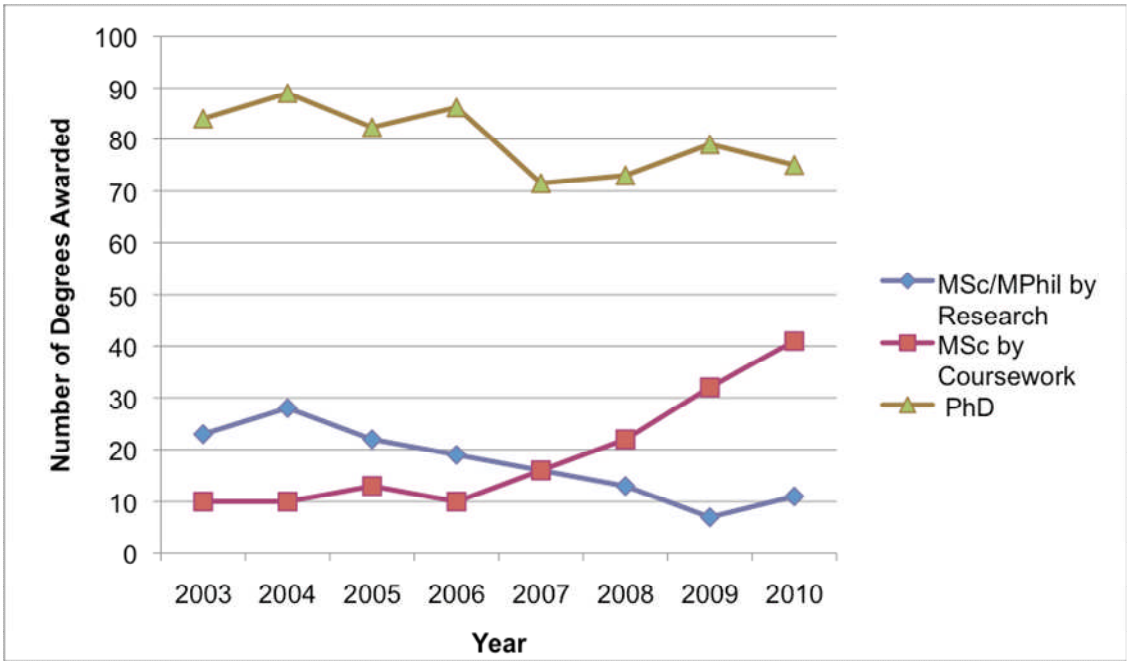


Figure 3. Output of higher geoscience degrees in 15 Australian universities 2003-2010. Note universities added to the survey in 2010 are not included.

Given this context the recent decision of Macquarie to close its Master of Geoscience program in 2012 is surprising. It is identified as a retraining degree for graduates who wish to change their role in the exploration and mining areas. Macquarie is presently considering other MSc options for the future.

In the five years leading up to 2007 the output of PhD degrees had remained static, but since 2007 there has been a decline of about 15% to 76 in 2010 (Table 6 and Figure 3). The decline has largely occurred at Curtin, JCU and UWA and may be related to 'industry competition' for talent given the orientation of these schools mentioned above. However Tasmania and Adelaide with a similar industry orientation have maintained their PhD output. ANU (12) produced the most PhD graduates in 2010 followed by Wollongong and Sydney (7 each) (Table 6).

Staffing Profiles

The long time viability of 'geoscience schools' is dependent upon a combination of both teaching and research. Although the emphasis in this survey is placed on teaching, institutions were asked to identify positions that were funded by the university and externally in both teaching and research order to gain an impression of the overall strength of various schools (Table 7 and Figure 4).

In 2010, 256 academic staff are engaged in some level of teaching of geoscience in Australian universities whilst a further 182 staff are engaged in research with no formal teaching commitments. The numbers in 2007 were 170 and 187 respectively. The dramatic difference is dominated by a significant change in reporting from the ANU following the merger of the Research School of Earth Sciences with the Department of Earth and Marine Sciences whereby teaching responsibilities have spread amongst formerly pure research staff. Smaller additional numbers are due to data also being obtained from Canberra, Flinders, Canberra, Latrobe and RMIT in this survey. Removing the ANU and these schools from the totals shows that nationally there has been an increase in 22 (13%) staff engaged in teaching whilst the number of research positions has increased by 18 (13%). In addition, there has been an overall increase in staff of 12 at ANU since 2007.

Consistent with the increase in teaching positions amongst the 'geoscience' schools there are now, 8 schools (3 in 2007) with more than 12 teaching positions, 5 (12 in 2007) with 8-12 teaching positions and 4 (4 in 2007) with fewer than 8 teaching positions. The research positions are unevenly distributed with 25 at UWA and Melbourne, 18-20 at Curtin and Tasmania, 5-14 at Adelaide ANU, JCU, Monash, Sydney and Wollongong and fewer than 5 at Macquarie, Newcastle, UNSW, UQ and QUT and none at Ballarat.

The the highly variable combination of teaching and research positions means that there is a wide range in the capabilities of the 'geoscience' universities (Figure 3) with ANU and UWA having in excess of 40 geoscience staff, Adelaide, Curtin, Melbourne, Tasmania, Wollongong having between 30 and 40, Monash, Queensland and Sydney having 20 to 30, and Ballarat and UNE having fewer than 10 staff. The high number (72) of positions at ANU reflects the unique nature of the Research School of Earth Sciences.

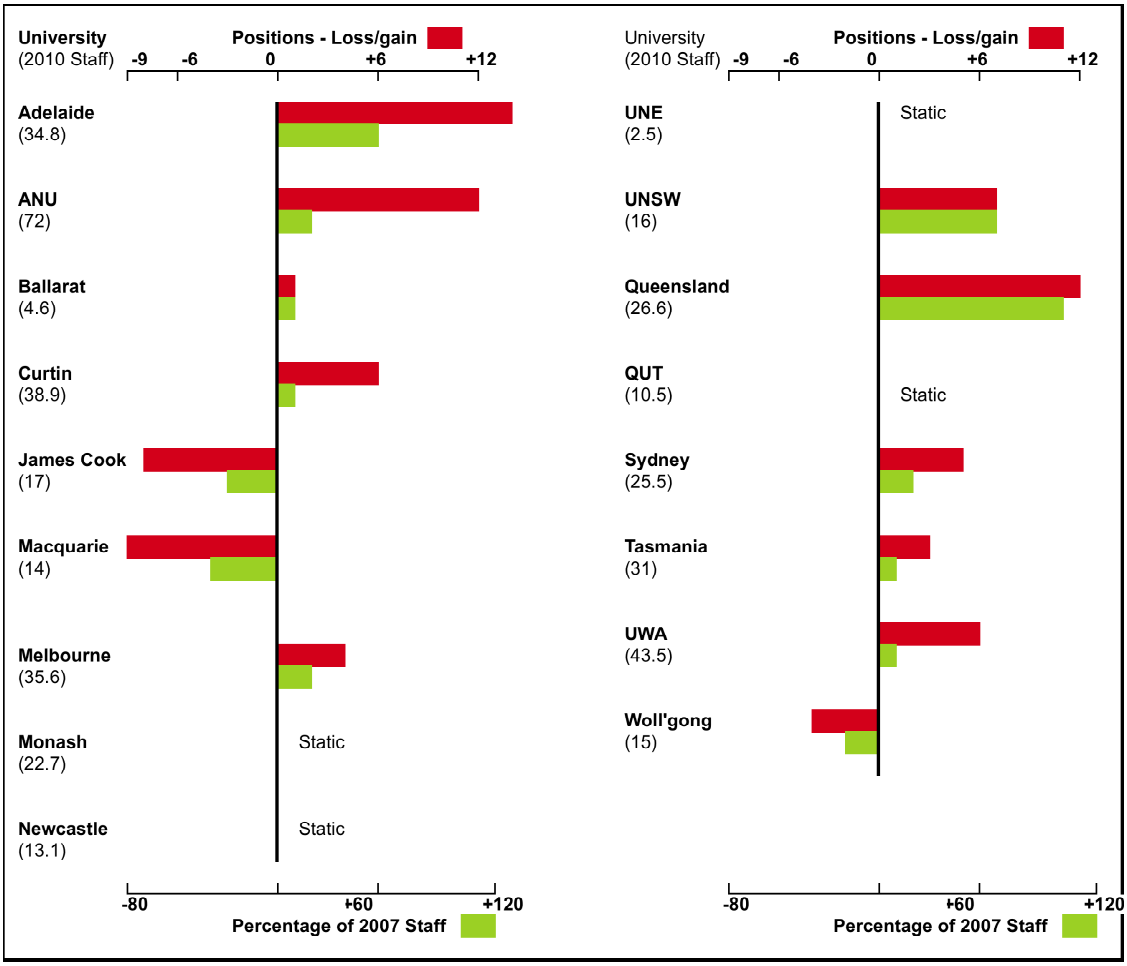


Figure 4 Geoscience staffing at Australian universities showing changes from 2007 to 2010

The growth or loss in geoscience positions at the various institutions is shown in Figure 4. Institutions showing the greatest growth in both geoscience teaching and research personnel since the 2007 survey have been Adelaide, ANU and Queensland with increase of 12 to 14 positions. Curtin, Melbourne, UNSW, Sydney and UWA have gained between 4 and 7 positions whilst Monash, UNE, Newcastle and QUT have been static and JCU, Macquarie and Wollongong have lost positions. However recruitments were reported to be underway at JCU and Newcastle and are anticipated at Monash.

Nationally, the total EFTSL per teaching academic is 9.6 with values for individual institutions ranging from 6.5 to 20. There are 4 institutions below 10 (6 in 2007), 6 between 10 and 15 (7 in 2007) and 6 above 15 (3 in 2007) (Table 7).

Nationally 11.5 of the teaching positions are externally funded and this is basically unchanged from 2007.

DISCUSSION OF THE ISSUES

The context for the 2007 survey was that AGC Member Societies were concerned that, as a result of earth science departments having been closed or amalgamated with other science departments, staffing was being reduced to a point where their capacity to deliver a serious undergraduate major in geoscience had been severely compromised.

The 2007 survey had shown that there were two fundamental issues underlying the situation at that time comprising a balance of:

- demand by students for geoscience places at university, particularly for honours and/or post-graduate study
    - an issue of interest in geoscience and job opportunities for graduates

- capacity of universities to deliver a quality undergraduate degree.
    - an issue of critical mass and appropriate levels of funding.

The 2010 survey has shown a turnaround in undergraduate enrolment in geoscience and has been dramatic at the Honours level. The commencement of the turnaround was evident in year 2 and 3 in the 2007 survey but it was unclear as to whether this would be sustained because of the Global Financial Crisis. The 2010 survey has clearly shown that this recovery has been sustained and strengthened and the enrolment in the Honours year has substantially reversed the decline seen in the decade up to 2007. The situation of geoscience in Australian universities is stronger now than at any time over the past 15 years.

There is no doubt that the continuing resources boom and the skill shortage has been the main driver in attracting students into geoscience. A contributing factor has also been a further 3 years of effort by resource industry bodies, AGC member societies in introducing earth science to school students and the wider community through various educational programs. These include the burgeoning programs such as Earth Science Western Australia and the Teacher Earth Science Education Program. The results of this survey show that the number of students commencing undergraduate study in geoscience has continued to increase and is independent of location. However, the capacity of universities to capitalize on this interest varies enormously. The reasons for this situation are not clear.

Some of the geoscience departments in this study have outreach programs to schools and the broader community. This indicates a proactive attitude to presenting geoscience in a positive way to the community. It may result in these schools presenting a more attractive face to geoscience for prospective students. Whilst there is no simple correlation, those schools that have no or minimal outreach program appear not to be capitalizing on the growing student interest compared with those institutions that do engage in outreach programs. For example Adelaide has a particularly effective outreach program and its enrolments have gone from strength to strength.

In WA, both Curtin and UWA have been able to capitalise on the profile afforded to the geosciences by the resources boom on their doorstep. This has been supplemented by the extensive and growing program of activities aimed at stimulating interest in the geosciences (e.g. Earth Science Western Australia) supported by industry and

professional societies. At Adelaide and Newcastle considerable support is provided by the State Government and its institutions.

Mechanisms to attract students in geoscience courses are crucial to the longer-term sustainability of many departments and the introduction of Earth and Environmental Science into the national curriculum at Years 11 – 12 in 2014 will be a positive step in exposing students to the earth sciences at school.

In 2007, it was concluded that in general Honours degrees were not attractive to students completing their basic degrees. Obviously with the resources boom there were alternative options such as immediate employment at attractive rates. This situation has completely turned around and may reflect a maturing of the recruitment market where more highly trained students are valued. It is instructive that even in 2007 those departments which offered a wide variety of options at Honours level and had access to specialist industry courses appeared to be doing better in their retention rates in translating from Level 3 to Honours (Table 7).

Several universities have reviewed their course structures and this is now occurring on an ongoing basis. This is in part due to increased enrolments and the need to streamline courses to manage teaching pressures, but also because there is much greater awareness of the skills required of graduates in the workforce. Increasingly sharing between institutions of specialist teaching particularly at the Honours and Masters levels is becoming more common and systematically organized as follows:

- The national MTEC program where 8 institutions teach courses into the Minerals Short Course Program at Honours level (Table 3);
- The Masters of Minerals Geoscience program operated by 3 universities under the auspices of MTEC (Table 3);
- The Sydney Universities Consortium of Teaching Geology and Geophysics – Honours Course Electives run by the Sydney metropolitan universities; and
- The Victorian Institute of Earth and Planetary Sciences Honours Program run by Melbourne, Latrobe, Monash and Ballarat.

Queensland is using an interesting approach to accessing specialist expertise. The geophysics courses are coordinated by an industry professional and courses in both geophysics and Ore Body Modeling are taught by industry professionals. This occurs through Queensland's ResTeach scheme, which facilitates the involvement of research only staff in teaching, through 10% or 25% fractional teaching appointments. Similarly a course in Quantitative Geology is being introduced and will be taught by applied mathematicians and computer scientists from the Earth System Science Computational Centre.

The impression gained from this survey is that schools are generally more conscious of the skills requirements of graduates and are adjusting their course content to meet the needs of potential employers in a more deliberate way than perhaps occurred in the past.

Several universities continue to comment upon the threat implied by the low enrolment rates in geoscience compared with more popular courses in science and other disciplines and the difficulty of maintaining expensive facilities and field programs. The change in structure of the undergraduate degree at Melbourne and the replacement of Honours by a 2 years MSc degree is very interesting in this context, but it will be some time before the full impact will be known. The commitment of UWA to adopting a form of this model in 2012 is also of interest.

The 2007 survey concluded that most of our 'geoscience degrees' were uneconomic on purely teaching basis and that an EFTSL per staff member of the order of 15-20 would be required for teaching to be economic in its own right. It was suggested that to be an economic on a teaching basis at the then student funding levels, the total EFTSL teaching load has to be of the order of 150-200 for a 'geoscience department' comprising 10 teaching academics - the target number to teach a well rounded geoscience major.

Since 2007, there has been a systematic increase in the EFTSL per teaching staff member with more universities above 15 and fewer below 10 despite the national increase in teaching academics. This indicates improving financial viability for many schools although some survey responses clearly comment on continuing financial pressures. The dramatic increase in student numbers in some teaching institutions has clearly impacted on teaching loads as evidenced by the increased EFTSL per academic. At Curtin where student growth has been particularly strong, Senior Research Fellows have assumed some teaching responsibilities.

The growth in MSc programs involving significant coursework also impacts on teaching loads and contributes to financial viability for those departments where this is occurring. However it is not simply a matter of increasing the number of students per academic. In 2007, several universities have commented that class sizes for laboratory and field work have a maximum effective size for practical teaching and there is an issue in maintaining the teaching capability to deliver courses at a more specialist level at Honours and Masters. As student numbers increase this has become an increasing issue and it is difficult to achieve the economies of scale to make teaching 'economic'.

Of course academics are also generally engaged in research and some universities place a higher premium on research than teaching so there is not a simple relationship between student numbers and numbers of academics involved in teaching. It is of interest that there has been an increase in the numbers of academic staff engaged in teaching as the student numbers have increased (e.g. Adelaide and UWA). Change in the academic profile is a particular issue at the moment and will be for some time as the 'baby boomer' generation of academics enters retirement.

Only where the department has sufficient academics with a broad portfolio of both teaching and research income and the capacity to share courses between institutions can these matters be managed to maintain the quality of the educational experience. Some of the comments provided by Curtin in the 2007 survey remain highly pertinent here;

To date, both geology and geophysics departments have managed to maintain the quality of their courses, although in geology the teaching loads are close to unsustainable. Field trip opportunities remain as they have been for 20 years, and facilities are as good now as they have

ever been, but our ability to maintain this into the future is dependent upon continued student demand and research success. Any decrease in student or research income could render one or both departments unsustainable, and the continual erosion of Commonwealth student funding relative to costs will start to bite once student intakes stabilise.

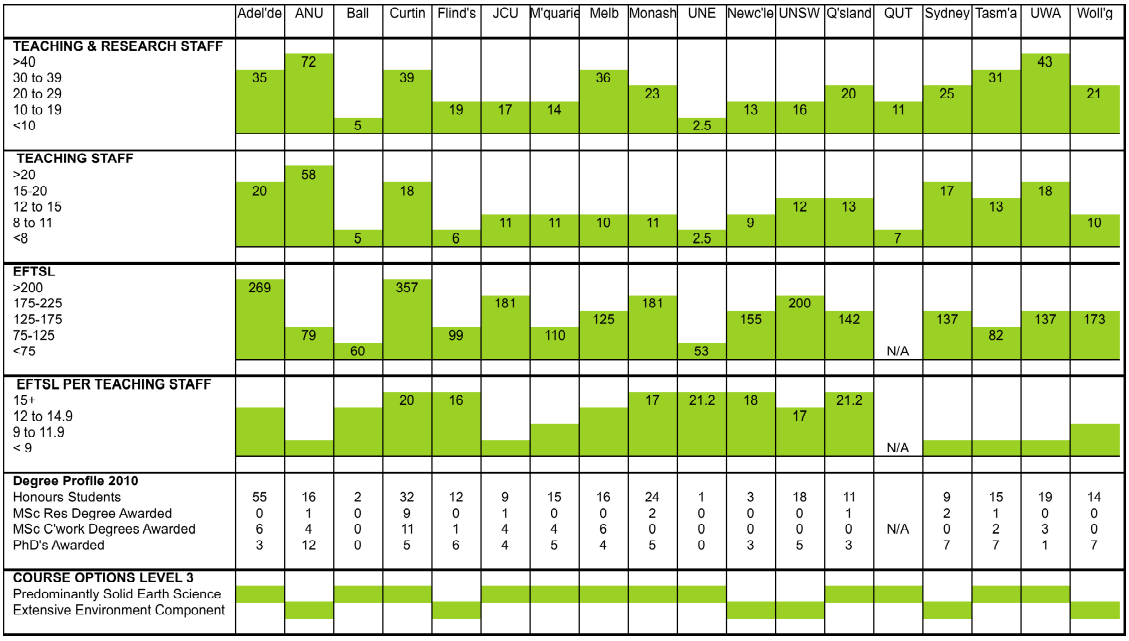
It remains to be seen whether the Federal Government initiatives in Tertiary Education will alleviate this position.

The survey also shows the academic profile has changed considerably in some universities since 2007 and is likely to continue to do so as the retirement of the 'baby-boomer' generation of academic staff proceeds. This represents both an opportunity and a threat. The opportunity lies in the ability to think creatively about the way departments operate and arrange their affairs to deliver a better overall outcome. The threat is that university administrations may focus on capturing the savings obtained from retiring staff and may not focus on the opportunities presented in geoscience schools which generally remain quite small in the context of the size of many academic disciplines in universities.

In this regard, the decline in output of doctorate degrees is a concern. It both affects the financial viability of schools and reduces the supply of geoscience researchers to the Australian research work force. At the time when the 'baby boomer' generation in the research work force is retiring and the demand for appropriately qualified staff in industry has never been higher, the supply of early career researchers is tightening in Australia. This phenomenon is not confined to Australia. It is inevitable that both in the short and longer term there will be difficulty in recruiting appropriately qualified staff to fill academic and research positions either from overseas or Australia.

The question raised in AGTEP 2007 remains highly pertinent: "What is the minimum economic department size that is sustainable in the longer run?" This has to have consideration of government funded student load, fee paying students, academic staff numbers, service teaching to other degrees, external funding for teaching and research funding. As this survey once again demonstrates these considerations vary from institution to institution and are not easily compared. However it is clear from this survey that some of the larger schools are thriving in comparison with many of the smaller schools.

Figure 5 compares the profile of the individual schools in terms of staff numbers EFTSL per staff member, higher degree output, and a summary of the course profile. It gives a first order impression of the long term sustainability of each school and its strategic positioning. Whilst the economics of universities are clearly quite complex, consideration of the issues outlined above makes it perfectly understandable why university administrators have amalgamated previously independent schools and disciplines.



	Adel'de	ANU	Ball	Curtin	Flind's	JCU	M'quarie	Melb	Monash	UNE	Newc'le	UNSW	Q'sland	QUT	Sydney	Tasm'a	UWA	Woll'g
TEACHING & RESEARCH STAFF																		
>40																		
30 to 39	35	72		39				36								31	43	
20 to 29									23				20		25			21
10 to 19					19	17	14				13	16		11				
<10			5							2.5								
TEACHING STAFF																		
>20																		
15-20	20	58		18								12	13		17		18	
12 to 15						11	11	10	11		9					13		10
8 to 11			5		6					2.5				7				
<8																		
EFTSL																		
>200																		
175-225	269			357		181			181			200						
125-175								125			155		142		137		137	173
75-125		79			99		110									82		
<75			60							53				N/A				
EFTSL PER TEACHING STAFF																		
15+																		
12 to 14.9				20	16				17	21.2	18		21.2					
9 to 11.9												17						
< 9														N/A				
Degree Profile 2010																		
Honours Students	55	16	2	32	12	9	15	16	24	1	3	18	11		9	15	19	14
MSc Res Degree Awarded	0	1	0	9	0	1	0	0	2	0	0	0	1		2	1	0	0
MSc C'work Degrees Awarded	6	4	0	11	1	4	4	6	0	0	0	0	0	N/A	0	2	3	0
PhD's Awarded	3	12	0	5	6	4	5	4	5	0	3	5	3		7	7	1	7
COURSE OPTIONS LEVEL 3																		
Predominantly Solid Earth Science																		
Extensive Environment Component																		

Figure 5: Profile of overall strength of Australian Universities in geoscience in 2010

The results of this study strongly suggest that a critical mass of teaching and research capability creating a vibrant and attractive educational experience is fundamental to retaining tertiary geoscience educational opportunities in Australia. To achieve this will require additional innovation and ongoing support from the profession to ensure the future supply of geoscience graduates to meet Australia's needs.

ACKNOWLEDGEMENTS

The AGC is appreciative of the respondents for the time and effort they have put into the survey and in responding to an earlier draft. Without their cooperation this comprehensive survey would not have been possible:

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TABLES

Table 1 Earth science degrees offered by Australian universities. Notes are by respondents on significant changes and issues.

Institution – School	Majors/Honours	Post Graduate Degrees
University of Adelaide School of Earth and Environmental Science	**BSc /BSc Advanced/BSc (Hons)** - **Geology** - **Geophysics** - **Environmental Geoscience** **BSc(Hons) Minerals geoscience** Note: In 2012 the number of Level III courses that make up a major will increase from 3 to 4 and Majors rationalised to two – 'Geology' & 'Geophysics & Applied Geology'. The Honours programs will also reduced from 3 to 2– 'Geology' and 'Geophysics'. Adelaide is a participant in the Minerals Geoscience Honours program (Table 3)	**MSc by research in geoscience, PhD**
School of Petroleum	**BSc (Hons) Petroleum Geoscience**	**MSc** (by coursework) **in Petroleum Geoscience,** **MPhil (Petroleum Geology and Geophysics), PhD**
Australian National University Research School of Earth Sciences	**BSc /Hons** - **Geology** - **Marine Science** **BSC (Hons) – Geophysics** Note: In 2012 undergraduate courses will be changed to give 'Earth Science' and 'Marine Science' majors and the following Minors: Earth Physics, Marine Geosciences, Geochemistry & Petrology. Additionally a Minor in Earth and Marine Sciences is offered to students with a major outside of geosciences. ANU is a participant in the Minerals Geoscience Honours program (Table 3)	**M.Phil by research, PhD** **MSc by coursework** - **Physics of the Earth**

Table 1 continued

Institution – School	Earth Science - Majors/Honours	Post Graduate Degrees
University of Ballarat School of Science and Engineering	**BAppSci/Hons** - **Geology** Note: Geoscience is also offered as part of BSc, BSc (Environmental Management) B.EngSci	**MSc App Sci (research), PhD**
University of Canberra Faculty of Applied Science – Environmental Science	Note BSc Enviro Sci can have an Earth Science component. Earth Science major to be proposed for about 1 year out.	**MSc (research), PhD**
Curtin University of Technology (Western Australian School of Mines - WASM). Department of Applied Geology Department of Exploration Geophysics	***BSc/ BSc (Hons) - Applied Geology*** ***BSc (Mineral Exploration & Mining Geology)*** Note: BSc (Mineral Exploration and Mining Geology) will become one of three streams within the BSc (Applied Geology) from 2012, when students will select 'Mining Geology', 'Petroleum Geology' or a comprehensive 'Applied Geology' stream in their third year. An Earth Science major will also be introduced to Curtin's general BSc from 2012, initially available only in a pairing with the Chemistry major. Curtin is a participant in the Minerals Geoscience Honours program (Table 3) ***BSc/ BSc (Hons) – Geophysics***	***Graduate Diplomas (Part time external)*** - ***Mineral Exploration Geoscience*** - ***Geophysics*** ***Postgraduate Diploma in Applied Geology*** *(1 year)* - *Basin Analysis & Petroleum Geology Major* - *Environmental Geoscience & Hydrogeology Major* - *Mineral Exploration & Mining Geology Major* ***MSc (Geology – coursework))*** - *Basin Analysis & Petroleum Geology Stream* - *Environmental Geoscience & Hydrogeology Stream.* - *Mineral Exploration & Mining Geology Stream* Note: Mineral Geoscience Masters program is offered jointly by JCU, Curtin, UTas and UWA see Table 3 ***MSc (Geophysics – coursework)*** ***Masters degrees by research*** *(1-2 years)* - ***MPhil (Geology)*** - ***MPhil (Geophysics)*** ***PhD***

Table 1 continued

Institution – School	Earth Science - Majors/Honours	Post Graduate Degrees
Flinders University of South Australia *School of the Environment*	**BSc/BSc(Hons) Environmental Science** - **Earth Sciences** - **Ocean & Climate** **BSc Groundwater Hydrology**	**MSc (Research), PhD** **Graduate Certificate, Graduate diploma, Masters – Coursework** - **Groundwater Hydrology** Note: The National Centre for Groundwater Research and Training was located in the School of the Environment in 2009
James Cook University School of Earth and Environmental Sciences	**BSc/BSc(Hons)** - **Geology** - **Environmental & Marine Geoscience (2012)** **BGeology (Hons)** Note: Credit points for "Integrated Learning" obtained by working in industry. JCU is a participant in the Minerals Geoscience Honours program (Table 3)	**MSc (Research), PhD** **MAppSci** - **Geology** - **Environmental and Earth Sciences** **Minerals Geoscience Masters** Note: Latter is offered jointly by JCU, Curtin, UTas and UWA (Table 3)
Latrobe Universiity Science Technology & Engineering - Environmental Geoscience	BSc /BSc (Hons) - **Environmental Geoscience** Note: Geoscience is offered as part of the general science degree, including environmental science.	**MSc (Research), PhD**
Macquarie University Department of Earth and Planetary Sciences	**BSc/BSc (Hons)** - **Geology** - **Geophysics** - **Environmental Geology** Note: Shares Hons units with other Sydney universities	**Master of Geoscience (coursework); MSc (research), PhD** Master of Geoscience is a retraining degree for those who wish to change their role in the exploration/ mining area. This degree will be terminated in 2012 and will likely end up with a MSc with geoscience specialization.
Monash University School of Geoscience	**BSc/BSc (Hons) – Geoscience, BEnvSc** Note: Geoscience can be taken as a major or minor in BSc, BA, BEng or double degrees. Monash participates in the Minerals Geoscience Honours program (Table 3)	**MSc (Research), PhD**

Table 1 continued

Institution – School	Earth Science - Majors/Honours	Post Graduate Degrees
University of Melbourne School of Earth Sciences (includes ocean and atmospheric sciences)	**BSc/BSc (Hons)** - **Geology** - **Atmosphere and Ocean Science** Other BSc students can take geoscience subjects without completing a major and students in other courses (e.g., BA, BComm) can also take geoscience as in the form of a small number of purpose-designed 'breadth' subjects (e.g. Introduction to Life, Earth & Universe) A small amount of geoscience is also available via the B Enviro degree. Melbourne participates in the Minerals Geoscience Honours program (Table 3)	**MPhil (Research)** – few undertaken**, PhD** **MSc (coursework)** Under the Melbourne Model, the Master of Science is being offered as a coursework program. It is a 2-year program of study including 3/4 year of coursework (including discipline-specific subjects as well as a small number of professional tools electives such as science communication, e-science etc) and 11/4 years of research project.. BScHons, (as well as the PGradCert and PGradDip) are still being offered along side the MSc, but are progressively transitioning to the MSc. and other programs being offered in special cases.
University of New England School of Environmental and Rural Science	**B GeoScience, with the following majors:** - **Mineral Deposits** - **Remediation** - **Fossil Fuels** **BSc/BSC (Hons), with the following majors:** - **Geology/Environmental Geosciences** - **Palaeobiology** Degrees (and individual subjects) are offered internally as well as via distance education. Some geoscience subjects offered by the University of Newcastle are also available via cross-institutional enrolment.	**MSc (Research), PhD**
University of Newcastle School of Environmental & Life Sciences	**BSc/BSc (Hons)** - **Earth Science** **B Environmental Science & Management/ BESM (Hons) - Earth Systems**	**MPhil (Research), PhD**

Table 1 continued

Institution – School	Earth Science - Majors/Honours	Post Graduate Degrees
University of New South Wales School of Biological; Earth & Environmental Sciences	**BSc/BSc (Hons); BAdvSc(Hons); BEnvSci** - **Geology** - **Environmental Earth Science** - **Marine Geoscience** - **Geochemistry** - **Geography (physical)**	**MSc (30% coursework, 70% research) & MPhil, PhD** **MSc (Coursework)** - **Masters in Spatial Information Systems with School of Surveying** Note: MSc in groundwater being discontinued
University of Queensland School of Earth Sciences	**BSc** - **Geological sciences** **BSc (Hons)** - **Geology** - **Exploration Geophysics** Note: Courses in Quantitative Geology and Geotechnical Engineering are being introduced and developing a program to train professional Field Geologists with industry embedded component.	**MSc (Research)** **MSc Mineral Resources (Exploration) (coursework and research)** Note: Participating in new Professional Masters program in Petroleum Engineering in collaboration with Heriot-Watt University. An agreement has been signed with Vale to develop a professional postgraduate training and research program in the areas of coal geosciences and coal geophysics. This program will offer training to Vale's global coal geoscientists and engineers and will also bring to UQ a large number of postgraduate students from Vale's operations.
Queensland University of Technology School of Biogeoscience	**BAppSc/BAppSc (Hons)** - **Geoscience**	**M AppSc** (a generic Faculty of Science research degree with limited coursework tailored to the individual needs of each candidate) **Post Graduate Diploma (coursework + thesis); PhD**
RMIT University School of Applied Sciences	**BApp Sci (Hons) - Physics (Geophysics)** Note: Retraining physicists as geophysicists for technical rather than geological expertise	**MSc, PhD** Note: Need physics or engineering prior degree and study geophysics

Table 1 continued

Institution – School	Earth Science - Majors/Honours	Post Graduate Degrees
University of Sydney School of Geosciences (includes geography, marine & environmental sciences)	**BSc/BSc (Hons)** - **Geology and Geophysics** - **Marine Science** - **Geography** - **Environmental Sciences** **BMarSc(Hons)** Note: The Sydney Universities Consortium of Geology and Geophysics (SUCGG) offers short courses to honours students – USyd requires 100 hours of course work in addition to thesis. This requirement is to address any shortcomings in undergraduate studies as they identify area of probable focus after graduation.	**MSc (research)** **Dept is involved in the following:** **MSc (coursework)** - **Environmental Science and Law** **MSc AppSci (coursework)** - **Spatial Information Science** - **Environmental Science** **Master Human Rights** Note: Both of the Applied Science degrees are articulated, offering a Graduate Diploma in Applied Science and a Master of Applied Science for international students, and a Graduate Certificate in Applied Science, a Graduate Diploma in Applied Science, and a Master of Applied Science for local students.
University of Tasmania School of Earth Sciences	**BSc** **BSc(Hons)** - **Geology** - **Geophysics*** - **Geochemistry*** - **Economic Geology*** Note: * Accredted by AusIMM. Tasmania participates in the Minerals Geoscience Honours program (Table 3)	**MSc (research)** **MSc (coursework)** - **Economic Geology** - **Exploration geoscience** Note: Mineral Masters program is offered jointly by JCU, Curtin, UTas and UWA see Table 3

Table 1 continued

Institution – School	Earth Science - Majors/Honours	Post Graduate Degrees
University of Western Australia School of Earth and Environment	**BSc/BSc(Hons) (In transition see note below)** - **Geology** - **Earth Science** - **Geochemistry** - **Environmental Geoscience** - **Marine & Coastal Management** **BSc (Hons) Geology & Resource Economics – 4 yrs** **BSc (Hons) Mineral Geoscience – 4yrs** **BSc (Hons) Petroleum Geoscience – 4yrs** Note: In the last few years UWA has offered the Geology major in several named science degrees (such as Earth Science, Mineral Geoscience, Geology & Resource Economics, Petroleum Geoscience, Geochemistry) as well as the BSc. However in 2012 UWA is moving to a Melbourne-type degree course and the Geology major will be offered in the BSc. This will be followed by a 1 year Honours or 2 year Masters degrees. The Geology major in 2012 remains fundamentally the same with reduction in applied areas (mineral and petroleum geoscience specifically) and transfer of this material to 4th year. In 2011 UWA has teaching arrangement with Curtin in Hydrogeology. UWA participates in the Minerals Geoscience Honours program (Table 3)	**MSc (research), PhD** **MSc (research - Hydrogeology)** **MSc (coursework/ coursework + thesis – Hydrogeology)** **MSc (coursework/coursework + thesis – Ore deposit Geology and Evaluation)** Note: There is a major change to postgraduate teaching and learning at UWA commencing 2012. 2-year Masters degrees (offering mixtures of coursework and research project) will be offered by the Geoscience Discipline in the School of Earth & Environment in 6 main programs: • Geology • Geophysics • Mineral Geoscience (minor modification of the current Ore Deposit Geology program) • Petroleum Geoscience • Hydrogeology (modification and ultimate expansion of current Hydrogeology program) • Geothermal Science Note: Mineral Masters program is offered jointly by JCU, Curtin, UTas and UWA see Table 3
University of Wollongong School of Earth and Environmental Sciences	**BSc/BSc (Hons)** - **Geology** - **Physical Geography** - **Geosciences** - **Environment** - **Land & Heritage Management** **BEnvSc (Hons)**	**MSc MEnvSc (research), PhD** **MEnvSc (Advanced) MSc (coursework – geology)** **MSc (coursework Physical Geography)**

Table 2 Earth science courses offered at levels 1-3 in Australian universities.

Institution – School	Level 1 Courses	Level 2 Courses	Level 3 Courses
University of Adelaide School of Earth and Environmental Science/ School of Petroleum	Earth Systems I Earths Interior I Others Earths Environment I Geology for Engineers	***Geology*** - Sedimentary Geology II, Structural Geology II, Igneous and Metamorphic Geology II, Landscapes Processes and Environments II, ***Mineral Geoscience*** - Economic and Mine Geology II, Introduction to Environmental Impact Assessment, ***Petroleum Geoscience*** - Introduction to Petroleum Geoscience and the Oil Industry, Drilling Engineering, Formation Evaluation, Petrophysics and Rock Properties, Introduction to Petroleum Engineering	***Geology Major*** - Field Geoscience III; Igneous & Metamorphic Geology III; Tectonics III; ***Environmental Geoscience Major*** – Environmental Geoscience Applications III; Environmental Geoscience Processes III; Remote Sensing III; Geographical Information Systems III; ***Geophysics Major*** – Geophysics III; Mineral Exploration III; Petroleum Exploration III; ***BSc Mineral Geoscience*** - Igneous and Metamorphic Geology III, Field Geoscience III, Tectonics III, Mineral Geoscience Research Project III, Geophysics III, Mineral Exploration III, ***BSc Petroleum Geoscience*** - Tectonics III, Petroleum Exploration III, Reservoir Geoscience III, Reservoir Characterization and Modelling, Field Geoscience III, Remote Sensing III: **and** two out of Geophysics III, Environmental Geoscience Applications III, Mineral Exploration III and Structural Geology and Seismic Methods
Australian National University Research School of Earth Sciences	The Blue Planet; Australia's Environment Introduction to Earth Science in the Field	Structure/Field; Surficial Processes; Chemistry of the Earth/; Resources and the Environment; Mineralogy; Lithosphere; Geophysics; Marine Paleontology;	Field Geology; Structural Geology; Economic Geology; Coral Reef Studies; Planetary Science; Magmatism & Metamorphism; Groundwater , Environmental Geoscience; Global Cycles & Paleo-oceanography; Coastal Environmental Earth Science; Ocean & Atmosphere Modeling
University of Ballarat School of Engineering and Science	Earth Sciences Planet Earth Introduction to Mineral Industry (elective at II & II) Landscape Evolution Earth's Living History	Structural Geology, Sedimentology, Hydrology, Regolith Science, Optical Mineralogy, Economic Geology, Fieldwork Principles and Practice, Paleontology	Petrology, Applied Geochemistry, Fieldwork, Geographic Information Systems, Applied Stratigraphy, Applied Geophysics, Project, Advanced Fieldwork; Engineering Geology

Table 2 continued

Institution – School	Level 1 Courses	Level 2 Courses	Level 3 Courses
University of Canberra Environmental Science	Earth Systems Science Earth Surface Processes	Australian Catchments; Ecochemistry (2012 New elective Australian Landscapes, Soils and Regolith)	Applied Geochemistry
Curtin University of Technology. Department of Applied Geology	Evolving Earth Systems & Paleontology; Geology 101, 102; Geoscience, Environment & Society; Geoscience Communication; Mining & Metallurgy	Mineralogy & Geochemistry; Sedimentology & Stratigraphy; Structural Geology; Field Geology Techniques; Igneous Petrology, Metamorphic Petrology; Geological Field Mapping;	Basin Analysis & Energy Resources; Hydrogeology & Engineering Geology; Field Mapping of Sedimentary Basins; Ore Deposits; Tectonics & the Dynamic Earth; Regolith Geology & Mineral Exploration; Environmental Geoscience; Geology Mapping Project; Economic Geology (two units); Resource Estimation & Mine Geology; Mining Systems; Field Geology of Precambrian Terranes; Reservoir Engineering Fundamentals; Petroleum Geophysics; Formation Evaluation; Petroleum Geology Project;
Department of Exploration Geophysics	Geophysics; Communication Skills; Geophysical Data Analysis; Properties of Matter and Electricity	Introduction to Geophysical Oil and Gas Exploration Methods; Propagation of Energy; Introduction to Geophysical Mineral Exploration Methods; Electromagnetic Fields in the Earth;. Note: All Proscribed courses for particular majors or named degrees	Gravity & Magnetics; Introduction to Seismic; Exploration; Resistivity & Induced Polarisation Methods; Global Geophysics; Electromagnetics & Radiometrics for Exploration; Geophysical Data Analysis; Geophysical Data Processing; Seismic Acquisition for Exploration; Environmental Geophysics; Geophysics Project. Note: All Proscribed courses for particular majors or named degrees
Flinders University of South Australia School of Environment (Earth Science Major)	Earth and Environment 1 Marine Sciences 1	Coasts and Oceans; Global Climate Change; Microclimate and Soil Processes; Surface Water Hydrology; Sedimentary Processes; Environmental Science 2	Geological Processes; Groundwater; Earth Fluid Modeling; Hydrochemistry; Science of Environmental Change; Field Investigations; Environmental Science 3

Table 2 continued

Institution – School	Level 1 Courses	Level 2 Courses	Level 3 Courses
James Cook University School of Earth and Environmental Sciences	Evolution of the Earth; Environmental Processes and Global Change; Systems Modeling and Visualisation	Earth Materials; Earth Resources, Exploration and Environment; Introductory Field Geology; Introduction to Geographic Information Systems; Statistics and Data Analysis for Environmental Science	Earth Dynamics; Deformation, Metamorphism and Hydrothermal Fluids; Ore Genesis; Geological Mapping; Advanced Geological Mapping; Earth and Environmental Geochemistry; Crustal Processes; Introduction to Sedimentology; Minesite Rehabilitation; Field Studies in Tropical Water and Soil Science; Advanced Hydrology; Advanced Geographic Information Systems; Sedimentary Environments and Energy Resources
Latrobe University Science Technology & Engineering - Environmental Geoscience	Processes that Shape the Earth; Earth Structure, Resources and History of Life	Environmental Enquiry A; Water Flow & Chemistry; Statistics for Life Sciences; Environmental Enquiry B; Chemistry of water Quality; ìImaging & Materials Characterisation	Water Resource Management; Environmental Research; Greenhouse Effect & Climate Change; Landscape & Climate Change; Remote Sensing & GIS
Macquarie University Department of Earth and Planetary Sciences	The Planet Earth Earth Dynamics, Marine Geoscience	Life the Universe and Everything; Introduction to Geophysics; Marine Depositional Environments; Field and Laboratory Studies in Geoscience; Introduction to Field Geology; Minerals Energy and the Environment; Geology of Australia – Global perspectives	Environmental & groundwater Geophysics; Exploration Geophysics; Field Geology & Mapping; liquid Fuels & Energy Security; Geochemical Applications & Techniques; Magmas Ores & Geochemistry; Structural & Metamorphic Geology; Data & Image Processing in Geophysics & Exploration; Volcanic geology Fieldwork; Environmental Geology; Earth & Planetary Sciences Special Interest Seminar; Global Tectonics
University of Melbourne School of Earth Sciences	The Global Environment; Understanding Planet Earth	Geology of SE Australia; Structural & Metamorphic Geology; Dangerous Earth; Minerals & Magmas; Field Mapping & Sedimentary Geology	Tectonics & Geodynamics; Sedimentary Geology; Geochemistry and Petrogenesis; Applied Geophysics; Economic Geology; Hydrogeology & Environmental Management; Advanced Field Geology. Digital Geoscience

Table 2 continued

Institution – School	Level 1 Courses	Level 2 Courses	Level 3 Courses
Monash University School of Geosciences	Planet Earth & its Environment: The Cosmic Connection; Planet Earth - Dynamic Systems;	The Dynamic Earth I; The Dynamic Earth II Global processes; The dynamic biosphere: changing fauna and flora through geological time; Field Geology	Field geology of New Zealand; Earth Sciences Project; Geophysics - Special topics; Earth sciences special studies 1; Earth sciences special studies 2; Deformation & Metamorphism of the Crust; Geophysics: Regional Mapping; Sediments, basins and resources; Volcanology and igneous petrology; Ore Deposit Geology & Global Metallogeny; Field Mapping; Hydrogeology & environmental geoscience; The dynamic biosphere: changing fauna & flora through geological time; Global Dynamics & Crustal Evolution
University of New England School of Environmental and Rural Science	Geology and the Environment I & II	Introductory Paleontology; Environmental Geology; Field Mapping & Sedimentology; Resource Geology & Environmental Issues Available from University of Newcastle Earth Science Field Course; Optical Mineralogy & igneous Petrology	Geophysics & Apllied GIS for Earth Sciences; Environmental & Exploration Geochemistry; Paleontology & Stratigraphy; Ore Deposit Geology; Environmental Geology; Available from University of Newcastle Igneous petrology & Crustal Evolution; Geology of Fuels; Metamorphic & Field geology
University of Newcastle School of Environmental & Life Sciences	Earth's Dynamic Systems Earth Processes & Products	Optical Mineralogy & Igneous Petrology; Earth Science Field Course; Earth's Sedimentary Rocks & Environments; Structural & Field Geology; GIS& Remote Sensing; River Basin Processes; Climatology & Soils;	Field - Carbonate Sediments; Geology of Fuels; Igneous Petrology & Crustal Evolution; Basin Analysis; Environmental Geology; Coastal Dynamics & Protection; Global Change; Geographic Information Systems; Advanced Field Course; Resource & Exploration Geology; Advanced Structural Geology; Environmental Remediation; Metamorphic & Field Geology; Biogeography & Biodiversity Management;

Table 2 continued

Institution – School	Level 1 Courses	Level 2 Courses	Level 3 Courses
University of New South Wales School of Biological; Earth & Environmental Sciences	Earth Systems & Processes (+Intro for Petroleum Engineers) Earth Environments & Resources Environmental Systems	Field research; Intro Geophysics; Life through Time; Structure; Earth Materials; Ground & Surface Water; Australian Climate & Vegetation Sedimentology & Surface Environments; Remote Sensing Applications; GIS	Field Methods & Mapping; Mineral & Energy Resources; Environmental Geochemistry; Petroleum Reservoir Geophysics; Special Topics in Petroleum; Australian Soil Use & Management; Geomorphology; Environmental Change; Advanced Techniques in Remote Sensing; Geographic Data Analysis; Environmental Impact Assessment; Coastal Resource Management.
University of Queensland School of Earth Sciences	Planet Earth: The Big Picture (2 units) Earth Processes & Geological Materials for Engineers	Mineralogy; Field Geology; Structural Geology; Paleobiology; Sedimentary Petrology & Stratigraphy; Igneous & Metamorphic Petrology	Ore Deposits & Exploration Geology; Introduction to Geophysics; Exploration Geophysics & mining; Sedimentary Environments; Tectonics & Crustal Evolution; marine Geology; Energy resources; Geochemistry; Geology of Coral Reefs; Ore Body Modeling; Advanced Structural Geology
Queensland University of Technology Biogeoscience	Planet Earth History of Life on Earth	Mineralogy; Sedimentary Geology; Structural Geology & Field Methods; Petrology of Igneous & Metamorphic Rocks;	Geophysics; Field Methods in Natural Resource Sciences; Geochemistry; Basin Analysis & Petroleum Geology; Plate Tectonics; Groundwater Systems;
University of Sydney School of Geosciences (includes geography, marine & environmental sciences)	Earth Environment & Society Introduction to Geology Other Engineering Geology	Economic Geography of Global Development Volcanoes, Hot rocks & Minerals; Oceans Coasts and Climate Change; Fluvial & Groundwater Geomorphology; Environmental & Resource Management	Earth's Structure and Evolution; Global Energy and Resources; Regional Development and Environment; Field Geology & Geophysics; Environmental & Sedimentary Geology; Geophysical Methods; Coastal Environments & Processes; GIS in Coastal Management; Geophysical Methods; Environmental Assessment;

Table 2 continued

Institution – School	Level 1 Courses	Level 2 Courses	Level 3 Courses
University of Tasmania *School of Earth Sciences*	Understanding Earth Systems Earth Resources Environments & Evolution	Earth's materials & Interior; Earth's surface; Introduction to Geophysics; Marine Geosciences;	Petrology; Tectonics & Volcanology; Sedimentary Environments & Resources; Geological Mapping; Computers in Geoscience; Economic Geology; Exploration Geophysics; Mineral Exploration; Environmental Geology
University of Technology Sydney Department of The Environment		*Elective for Environment degrees* *Geological Processes; GIS & Remote Sensing; Marine Geosciences*	
University of Western Australia School of Earth and Environment	Earth & Environment - Dynamic Planet Earth & Environment - Geological Perspective	Earth Materials; Field Geology; Earth History Methods; Structural& Metamorphic Geology; Introduction to Geochemistry,	Geological Mapping; Marine Geology; Geochemistry & Petrology; Structural Geology & Tectonics; Basin Analysis; Mineral Exploration Technology; Ore Deposit Genesis;
University of Wollongong School of Earth and Environmental Sciences	Planet Earth; Earth Environment & Resources; Landscape Change & Climatology; The Human Environment; Problems & Change; Climate Change	Earth's Inferno; Introductory Spatial Science; Sediments & Fuels; Field Geology; Soils, Landscapes & Environmental Change; Environmental Impact of Societies; Other: Geology for Engineers	Plate Tectonics, Macrotopography & Earth History; Resources & Environments; Water Resources & Management; Fluvial Geomorphology & Sedimentology; Geographic Information Science; Remote Sensing of the Environment

Table 3 Minerals geoscience courses sponsored at Honours and Masters levels by Minerals Council of Australia (Minerals Tertiary Education Council)

Shortcourse Program (Honours)

Students enrolling in Honours at one of eight Australian Universities (Adelaide, ANU, Curtin, James Cook, Melbourne, Monash, UTas, UWA) have the opportunity to participate in the Minerals Tertiary Education Council (MTEC) Minerals Geoscience Honours Program (MGH). Travel bursaries are available to offset the costs of students travelling to the site of the relevant course.
The MGH courses have been prepared based on the advice of a panel of senior professionals from the mining and exploration industry. Each course is designed to address specific knowledge and skills relevant to future employment as a minerals industry professional. They are encouraged to enroll in two of the following courses.

Geology from Geophysics (Monash);
Exploration Skills Mapping (Tasmania);
Applied Structural Geology in Mining and Exploration (UWA);
Mineral Exploration Under Cover (Adelaide);
Advanced Hydrogeology Melbourne);
Ore Textures and Breccias in Mineralised Systems (JCU);
Regolith Geoscience and Mineral Exploration (ANU)
Mining Geology and Resource Evaluation (Curtin)

Travel bursaries are available to offset the costs of students travelling to the site of the relevant course.

Minerals Geoscience Masters Program

The Minerals Geoscience Masters Program (Ore Deposit Geology and Evaluation) is supported by the Minerals Council of Australia. The coursework Masters program is designed for geoscientists who want to gain up to date knowledge and skills in economic geology and mineral exploration. The course structure is flexible with the choice between full or part-time study, coursework plus dissertation or coursework only options, three home institutions (University of Western Australia, University of Tasmania and James Cook University) and 16 coursework units offered across four institutions. There are no formal exams, a variety of entry paths (BSc plus a minimum 2 years relevant experience, BSc (Hons) or Graduate Diploma of Science).

The course at UWA is part of the Minerals Geoscience Masters (MGM) program and is supported by the Minerals Council of Australia (MCA). The program is run jointly between the Centre for Exploration Targeting (CET, a joint centre between the University of Western Australia and Curtin University), the Centre for Ore Deposit Research (CODES, University of Tasmania), the School of Earth and Environmental Sciences (EES, James Cook University) and the Western Australian School of Mines (WASM) and the Department of Mineral & Energy Economics (DMEE) at the Curtin Graduate School of Business (CGSB).

Table 4: Profile of capability of Australian Universities to supervise geoscience theses for Honours and higher degrees at Australian universities

Code	Topic	Adelaide	ANU	Ball	Canb'a	Curtin	Flinders	LaTrobe	JCU	M'quarie	Melb	Monash	UNE	Newc'le	UNSW	Q'sland	QUT	RMIT	Sydney	Tasm'a	UWA	Woll'g	Code
0402	GEOCHEMISTRY																						0402
040201	Exploration Geochemistry																						040201
040202	Inorganic Geochemistry																						040202
040203	Isotope Geochemistry																						040203
040204	Organic Geochemistry																						040204
040299	Geochemistry not elsewhere classified																						040299
0403	GEOLOGY																						0403
040301	Basin Analysis																						040301
040302	Extraterrestrial Geology																						040302
040303	Geochronology																						040303
040304	Igneous and Metamorphic Petrology																						040304
040305	Marine Geoscience																						040305
040306	Mineralogy and Crystallography																						040306
040307	Ore Deposit Petrology																						040307
040308	Palaeontology (incl. Palynology)																						040308
040309	Petroleum and Coal Geology																						040309
040310	Sedimentology																						040310
040311	Stratigraphy (incl. Biostratigraphy and Sequence Stratigraphy)																						040311
040312	Structural Geology																						040312
040313	Tectonics																						040313
040314	Volcanology																						040314
040399	Geology not elsewhere classified																						040399
0404	GEOPHYSICS																						0404
040401	Electrical and Electromagnetic Methods																						040401
040402	Geodynamics																						040402
040403	Geophysical Fluid Dynamics																						040403
040404	Geothermics and Radiometrics																						040404
040405	Gravimetrics																						040405
040406	Magnetism and Palaeomagnetism																						040406
040407	Seismology and Seismic Exploration																						040407
040499	Geophysics not elsewhere classified																						040499
0406	Physical Geography & Environmental Geoscience																						0406
040601	Geomorphology, Regolith & Landscape Evolution																						040601
040602	Glaciology																						040602
040603	Hydrogeology																						040603
040604	Natural Hazards																						040604
040605	Palaeoclimatology																						040605
040606	Quaternary Environments																						040606
040607	Surface Processes																						040607
040608	Surfacewater Hydrology																						040608
040699	Physical Geography and Environmental Geoscience not elsewhere classified																						040699
0499	OTHER EARTH SCIENCES																						0499
060206	Palaeoecology																						060206

Table 5: enrollment data for undergraduate courses at Australian universities in the period 2003-2010

	Average Course Size								No of Courses 2010		Equivalent Full Time Student Load								2010 - % Change 0ver 2007
	2003	2004	2005	2006	2007	2008	2009	2010			2003	2004	2005	2006	2007	2008	2009	2010	
University of Adelaide (includes geoscience students in Australian School of Petroleum - ASP)																			
Year 1	90	166	192	147	162	148	168	189	3		34	41	48	55	61	74	84	71	16
Year 2	35	31	52	52	68	106	105	107	5		27	23	31	30	40	53	66	67	67
Year 3	16	19	34	36	36	51	76	68	9		26	30	38	41	41	57	86	77	87
Hons	14	8	9	19	23	19	35	41			14	8	9	19	23	19	35	41	78
ASP Hons*	**10**	**10**	**6**	**8**	**5**	**4**	**10**	14		*	**10**	**10**	**6**	**8**	**5**	**4**	**10**	14	180
Y3/Y1 Retention			37.78%	21.69%	18.75%	34.69%	46.91%	45.95%		Total	111	112	132	153	170	207	280	269	58
Hons/Yr3 Retention 1		50.00%	47.37%	55.88%	63.89%	52.78%	68.63%	53.95%											
Hons/Yr3 Retention 2		112.50%	78.95%	79.41%	77.78%					*	Includes a number of overseas students entering at honours level								
Australian National University (only averaged data given to 2007)																			
Year 1	80	70	50	50	100	77	73	68	2		20	12	12	17	12	19	18	17	42
Year 2	40	35	30	30	35	26	27	20	7		20	17	15	15	17	23	24	18	3
Year 3	19	19	15	15	20	16	20	19	12		14	14	11	11	15	24	30	29	90
Hons	15	15	15	14	7	16	14	16			15	15	15	14	7	16	14	16	129
Y3/Y1 Retention			18.75%	21.43%	40.00%	32.00%	20.00%	24.68%		Total	69.25	58.25	53.25	57.25	51	82	86	79	55
Hons/Yr3 Retention		78.95%	78.95%	93.33%	46.67%	80.00%	87.50%	80.00%											
University of Ballarat (only averaged data given to 2007)																			
Year 1	15	14	23	23	28	54	36	50	5		7	7	11	11	14	27	18	25	79
Year 2	11	16	13	16	17	28	29	22	7		8	12	10	12	13	25	25	19	48
Year 3	11	9	11	16	17	12	17	20	7		8	7	8	10	12	8	12	14	17
Hons	5	5	3	2	2	1	1	2			5	5	3	2	2	1	1	2	0
Y3/Y1 Retention			73.33%	114.29%	73.91%	52.17%	60.71%	37.04%		Total	28	31	32	35	41	61	56	60	47
Hons/Yr3 Retention		45.45%	33.33%	18.18%	12.50%	5.88%	8.33%	11.76%											
University of Canberra																			
Year 1							30	42	2								4	11	
Year 2								30	2									8	
Year 3								10	1									1.25	
Hons/Yr4																			
Y3/Y1 Retention										Total								19	
Hons/Yr3 Retention																			
Curtin University - Applied Gology (data to 2007 includes geophysics)																			Overall*
Year 1	32	56	52	68	87	143	149	155	11		34	63	58	78	102	112	126	141	58
Year 2	13	13	21	20	36	57	74	82	21		28	29	46	45	67	44	63	74	42
Year 3	9	10	11	16	16	30	43	59	43		30	33	40	60	57	23	36	53	21
Hons/Yr4	14	5	5	8	2	2	6	13	4		25	12	9	19	8	2	5	12	300
Y3/Y1 Retention			34.38%	28.57%	30.77%	44.12%	49.43%	41.26%		Total	117	137	153	202	234	181	230	280	53
Hons/Yr3 Retention		55.56%	50.00%	72.73%	12.50%	12.50%	20.00%	30.23%											
Exploration Geophysics																			
Year 1						14	18	20			* Overall icludes both geology and geophysics					14	18	20	
Year 2						30	15	21								30	15	21	
Year 3						20	21	16								20	21	16	
Hons/Yr4						10	8	20								10	8	20	
										Total						74	62	77	

Table 5 continued	Average Course Size 2003	2004	2005	2006	2007	2008	2009	2010	No of Courses 2010		Equivalent Full Time Student Load 2003	2004	2005	2006	2007	2008	2009	2010	2010 - % Change over 2007
Flinders University	(Earth Science/hydogeology major in Environmental Science degree)																		
Year 1									2							36	42	46	
Year 2									3							27	19	27	
Year 3									4							14	25	14	
Hons/Yr4									7							5	18	12	
										Total						82	104	99	
James Cook University						Average Data only													
Year 1	90	72	90	102	109	171	150	243			33	27	34	38	39	86	75	122	213
Year 2	15	24	24	27	23	24	33	48			17	24	24	27	23	18	25	36	57
Year 3	15	12	14	11	13	13	16	18			22	16	18	14	17	10	12	14	-21
Hons/Yr4	13	9	10	5	2	4	9	9			13	13	9	10	5	4	9	9	80
Y3/Y1 Retention			15.56%	15.28%	14.44%	12.75%	14.68%	10.53%		Total	85	80	85	89	84	118	121	181	115
Hons/Yr3 Retention		60.00%	83.33%	35.71%	18.18%	30.77%	69.23%	56.25%											
LaTrobe University																			
Year 1						82	95	97	2							21	24	24	
Year 2																			
Year 3					Years 2 and 3	29	26	32	3							8	8	9	
Hons/Yr4						4.5	1.5	3.5								5	2	4	
Y3/Y1 Retention										Total						33	34	37	
Macquarie University																			
Year 1	123	114	110	115	135	166	146	186	3		49	45	43	46	54	58	37	47	-14
Year 2	37	28	28	29	28	35	46	68	6		39	26	26	28	27	16	22	32	18
Year 3	14	22	16	18	17	22	26	25	6		20	30	21	25	20	15	17	17	-18
Hons/Yr4	6	1	11	5	***5***	6	5	15			6	1	11	5	***5***	6	5	15	200
Y3/Y1 Retention			13.01%	15.79%	15.45%	19.13%	19.26%	15.06%		Total	114	102	101	104	106	95	80	110	4
Hons/Yr3 Retention		7.14%	50.00%	31.25%	27.78%	35.29%	22.73%	57.69%											
Melbourne University																			
Year 1	146	127	121	133	140	153	158	147	2		36	32	30	33	35	38	40	37	5
Year 2	32	51	52	43	48	59	55	74	5		20	32	32	26	30	37	34	46	54
Year 3	28	28	29	32	33	32	32	30	7		25	25	29	33	29	28	28	26	-9
Hons	24	22	25	25	18	28	19	16			24	22	25	25	18	28	19	16	-11
Y3/Y1 Retention			19.86%	25.20%	27.27%	24.06%	22.86%	19.61%		Total	105	111	116	117	112	131	121	125	12
Hons/Yr3 Retention		78.57%	89.29%	86.21%	56.25%	84.85%	59.38%	50.00%											
Monash University																			
Year 1	187	216	193	192	192	201	196	310	2		47	54	49	48	48	50	49	77	60
Year 2	33	44	38	56	72	70	72	62	4		21	22	19	28	36	35	36	31	-14
Year 3	16	18	21	17	30	27	33	30	13		24	28	31	28	49	44	54	49	-1
Hons	6	7	14	16	***13***	29	22	24	2		4	4	11	13	***13***	29	22	24	85
Y3/Y1 Retention			11.23%	7.87%	15.54%	14.06%	17.19%	14.93%		Total	96	108	110	117	146	158	161	181	24
Hons/Yr3 Retention		43.75%	77.78%	76.19%	76.47%	96.67%	81.48%	72.73%											

Table 5 continued	Average Course Size 2003	2004	2005	2006	2007	2008	2009	2010	No of Courses 2010		Equivalent Full Time Student Load 2003	2004	2005	2006	2007	2008	2009	2010	2010 - % Change 0ver 2007
University of New England (only EFTSL given)																			
Year 1											20	20	18	15	16	20	36	26	63
Year 2											7	8	12	12	7	15	19	22	214
Year 3											3	3	5	7	8	5	5	4	-50
Hons											3	3	2	2	2	2	1	1	-50
										Total	33	34	37	36	33	42	61	53	61
University of Newcastle																			
Year 1	132	100	87	101	105				2		66	50	44	50	52	37	47	44	-15
Year 2	31	31	36	41	41				7		47	47	54	62	71	48	55	73	3
Year 3	20	22	25	24	34				6		56	56	64	49	51	27	35	35	-31
Hons	4	5	5	2	6						4	5	5	2	6	2	2	3	-50
Y3/Y1 Retention			18.94%	24.00%	39.08%					Total	173	158	167	163	180	114	139	155	-14
Hons/Yr3 Retention		25.00%	22.73%	8.00%	25.00%														
University of New South Wales																			
Year 1	87	96	112	122	165	166	175	172	3		33	36	42	46	62	63	66	68	10
Year 2	23	19	16	19	20	35	31	37	9		15	14	12	14	15	39	36	42	180
Year 3	25	20	25	25	23	31	34	29	9		22	20	28	27	22	42	46	44	100
Hons	5	6	5	3	5	9	13	16			5	6	5	3	3	9	12	18	500
Y3/Y1 Retention			28.74%	26.04%	20.54%	25.41%	20.61%	17.47%		Total	75	76	87	90	102	153	160	172	69
Hons/Yr3 Retention		24.00%	25.00%	12.00%	20.00%	39.13%	41.94%	47.06%											
Post Grad Coursework incl servicing Petrol Eng						14	28	20								16	19	28	
University of Queensland																			
Year 1	160	170	170	200	210	241	304	317	2		40	42	42	50	52	60	76	79	52
Year 2	21	19	18	26	33	34	41	30	6		13	12	11	16	21	25	31	22	5
Year 3	18	13	14	7	20	18	25	30	8		16	11	12	6	17	15	29	30	76
Hons	13	11	9	11	5	2	4	11			13	11	9	11	5	2	4	11	120
Y3/Y1 Retention			8.75%	4.12%	11.76%	9.00%	11.90%	12.45%		Total	82	76	74	83	95	102	140	142	49
Hons/Yr3 Retention		61.11%	69.23%	78.57%	71.43%	10.00%	22.22%	44.00%											
Queensland University of Technology																			
Year 1	86	80	70	61	85				2		21	20	17	15	21	*21*	*21*	*21*	
Year 2	21	24	25	32	41				7		15	18	22	28	36	*36*	*36*	*36*	
Year 3	15	15	19	12	20				8		15	15	19	12	20	*20*	*20*	*20*	
Hons	5	2	5	3	2						5	2	5	3	2	*2*	*2*	*2*	
Y3/Y1 Retention			22.09%	15.00%	28.57%					Total	56	55	63	58	79	*79*	*79*	*79*	
Hons/Yr3 Retention		13.33%	33.33%	15.79%	16.67%											Data reproduced from 2007			
RMIT University																			
Hons						1	3	3								1	3	3	

Table 5 continued	Average Course Size								No of Courses 2010		Equivalent Full Time Student Load								2010 - % Change 0ver 2007
	2003	2004	2005	2006	2007	2008	2009	2010			2003	2004	2005	2006	2007	2008	2009	2010	
Sydney University																			
Year 1	116	92	100	100	150	188	272	269	2		87	69	75	76	76	68	90	91	20
Year 2	25	33	40	39	47	41	51	55	3		19	33	40	39	35	16	21	18	-49
Year 3			19	22	21	25	34	29	6		***16***	***24***	24	27	26	14	19	19	-27
Hons	5	8	5	11	9	9	11	9	2		5	8	5	11	9	9	11	9	0
Y3/Y1 Retention			16.38%	23.91%	21.00%	25.00%	22.67%	15.43%		Total	127	134	144	153	146	107	141	137	-6
Hons/Yr3 Retention				57.89%	40.91%	42.86%	44.00%	26.47%											
University of Tasmania (only averaged data given)																			
Year 1	81	127	90	105	95	89	91	98			20	32	22	26	24	22	23	25	2
Year 2	25	29	46	43	32	34	34	43			9	11	17	16	12	17	17	22	79
Year 3	15	16	16	30	18	14	13	19			9	10	10	19	11	16	15	21	94
Hons	20	14	9	8	13	7	13	15			20	14	9	8	13	7	13	15	15
Y3/Y1 Retention			20%	24%	20%	13%	14%	21%		Total	58	67	58	69	60	62	67	82	37
Hons/Yr3 Retention		93%	56%	50%	43%	39%	93%	115%											
University of Technology Sydney (Earth and Environment degree closed 2003)																			
Year 1	55	52	91	71	93				1		7	6	11	9	12				
Year 2	10	4	0	58	60				1		6	1	0	7	8				
Year 3	12	12	8	0	20				1		6	6	1	0	3				
Hons	0	2	2	1	2						2	1	2	2	0				
										Total	21	14	14	18	23				
University of Western Australia																			
Year 1		70	90	139	169	186	211	209	2		17	17	22	35	42	47	53	52	24
Year 2		17	18	29	54	52	51	53	5		9	9	9	15	27	33	32	33	23
Year 3		7	14	11	20	29	33	30	7		5	5	15	12	23	30	34	32	40
Hons		10	4	11	12	10	10	19			9	10	4	11	12	10	10	19	58
Y3/Y1 Retention				15.71%	22.22%	20.86%	19.53%	16.13%		Total	40	41	50	73	104	119	129	137	31
Hons/Yr3 Retention			57.14%	78.57%	109.09%	50.00%	34.48%	57.58%											
University of Wollongong							Average data est									Levels 1&2 estimates only 2008-10			
Year 1		123	153	108	171			100	3		60	61	76	54	86	50	50	50	-42
Year 2		57	53	69	73			65	4		68	71	66	69	73	65	65	65	-11
Year 3		43	27	31	40			55	4		40	43	36	41	54	34	42	44	-19
Hons	3	4	4	3	4	18	13	14			3	4	4	3	4	18	13	14	250
Y3/Y1 Retention				25.20%	26.14%					Total	171	179	182	167	217	167	170	173	-20
Hons/Yr3 Retention			9.30%	11.11%	12.90%														
National Total											**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	
Year 1		1745	1794	1837	2196					Year 1	631	634	654	702	808	887	953	1047	30
Year 2		475	510	629	728					Year 2	388	409	446	489	558	574	621	684	23
Year 3		285	318	323	398					Year 3	357	376	410	422	475	440	548	553	16
Hons		144	146	155	135					Hons	185	154	148	171	142	185	198	265	86
Y3/Y1 Retention				18.51%	22.19%					Total	1561	1573	1658	1784	1983	2085	2317	2548	29
Hons/Yr3 Retention			51.23%	48.74%	41.80%														

Table 6 Completed post-graduate degrees in geoscience awarded at Australian universities 2003-2010

University / Degree	2003	2004	2005	2006	2007	2008	2009	2010
University of Adelaide								
MSc/MPhilRes			1	1	1	3	0	0
MSc coursework						5	8	6
PhD	3	4	3	4	5	6	6	3
Australian National University								
MSc/MPhilRes	2	3	3	4	4	1	1	1
MSc coursework	3	2	1	3	2	4		4
PhD	13	7	9	12	13	6	10	12
University of Ballarat								
MSc/MPhilRes	1							
MSc coursework								
PhD				1	1	1		
University of Canberra								
MSc/MPhilRes								
MSc coursework								1
PhD	2	2	1	1	1		1	2
Curtin University Applied Geology (includes Geophysics 2003-2007)								
Grad Diplomas	1	2	1	0	0	0	0	2
Postgraduate Diplomas	1	3	1	6	1	9	4	12
MSc/MPhilRes	0	6	1	0	0	0	1	3
MSc coursework	4	5	6	2	3	3	6	11
PhD	4	7	6	6	3	2	2	3
Curtin University Geophysics 2008-2010)								
Grad Diplomas						4	2	6
MSc/MPhilRes						0	1	0
PhD						1	4	2

University / Degree	2003	2004	2005	2006	2007	2008	2009	2010
Monash University								
MSc/MPhilRes	3	3	2	2	2	4	2	2
MSc coursework								
PhD	8	5	5	2	2	10	7	5
University of New England								
MSc/MPhilRes								
MSc coursework								
PhD	1		3					
University of Newcastle								
MSc/MPhilRes								
MSc coursework								
PhD	0	3	2	3	1	2	3	3
University of New South Wales								
MSc/MPhilRes	3	3	6	3				
MSc coursework								
PhD	4	3	1	2	3	3	4	5
University of Queensland								
MSc/MPhilRes	2			4		1		1
MSc coursework								
PhD	5	5	7	6		3	2	3
Queensland University of Technology								
MSc/MPhilRes	2	5	1	2				
MSc coursework								
PhD	0	5	1	2	1	*1*	*1*	*1*
								Copied from 2007
RMIT University								
MSc						1	0	0
PhD						0	1	1

Table 6 continued

University / Degree	2003	2004	2005	2006	2007	2008	2009	2010
Flinders University								
MSc/MPhilRes								
MSc coursework						3	1	2
PhD						2	0	6
James Cook University								
MSc/MPhilRes	3	4	1	0	0	0	1	1
MSc coursework	2	3	4	3	8	1	3	4
PhD	3	10	12	16	9	8	3	4
La Trobe University								
MSc/MPhilRes								
MSc coursework								
PhD	1	2	2	2	2	0	1	1
Macquarie University								
MSc/MPhilRes	2		1		1			
MSc coursework					1	2	6	4
PhD	3		5	5	4	6	8	5
University of Melbourne								
MSc/MPhilRes								
MSc coursework				1	1			6
PhD	10	9	8	8	9	7	10	4

University / Degree	2003	2004	2005	2006	2007	2008	2009	2010
University of Sydney								
MSc/MPhilRes	4	3	3	2	3	3	2	2
MSc coursework								
PhD	5	7	4	6	4	1	3	7
University of Tasmania	Graduate Diplomas							
MSc/MPhilRes					1	0	0	1
MSc coursework	1		2	1	1	4	7	2
PhD	7	9	2	1	8	9	5	7
University of Western Australia								
MSc/MPhilRes	1	6	***3***	***3***	***3***			
MSc Econ Geolo/Geochem						2	1	3
PhD	12	10	9	5	4	1	3	1
University of Wollongong								
MSc/MPhilRes								
MSc coursework								
PhD	***3***	***6***	***3***	***6***	***3***	***7***	***6***	***7***
National Total								
MSc/MPhilRes	25	33	23	21	16	13	7	11
MSc coursework	10	10	13	10	16	25	33	43
PhD	84	94	83.3	88.2	72.5	76	80	82

Table 7 Teaching and research staff at Australian universities

Teaching Positions	Total	Funding Source			Field of Term Appointment	**Research positions**	Total	Funding Source			Field of Application of Term Position - funding source
		University		External				University		External	
		Perm.	Term Position					Perm.	Term Positions		
	FTE	FTE	FTE	FTE			FTE	FTE	FTE	FTE	
University of Adelaide						**University of Adelaide**					
Professor	8.2	5	0.86	2.33	Mining Geology; Mineral Exploration; Pet Geol	Professor	0.8			0.8	Co2 Sequestration - CO2 CRC
Associate Professor	3	2	0.5	0.5	Minerals Geoscience	Professorial Fellow	1			1	Mineralogy -ARC
Senior Lecturer	4	4				Prin. Research Fellow					
Lecturer	5		3.6	1.4	Metamorphic Geology; Structural Geol	Snr Research fellow	3.8			3.8	Biogeochem, Geophysics - ARC: Seals - CO2CRC
Demonstrator						Research Fellow	8			8	Various, ARC, depCRC Co2CRC
Total	20.2	11	4.96	4.23		Research Associate	1		1		Stratigraphy
2010 EFTSL/Staff	**13.3**					Total	14.6	0	1	13.6	
Australian National University (DEMS and RSES)						**Australian National University (DEMS and RSES)**					
Professor	16	15		1		Professor	1				
Associate Professor	16	16				Professorial Fellow				1	ARC
Senior Lecturer						Prin. Research Fellow					
Lecturer	26	14	12			Snr Research fellow	2			2	ARC
Demonstrator						Research Fellow	11			11	Mixed
Total	58	45	12	1		Research Associate					
2010 EFTSL/Staff	**1.4**					Total	14	0	0	14	
University of Ballarat						**University of Ballarat** (no positions)					
Professor											
Associate Professor											
Senior Lecturer	0.6	0.6									
Lecturer	4	2	2								
Demonstrator											
Total	4.6	2.6	2								
2010 EFTSL/Staff	**13.1**										
University of Canberra						**University of Canberra**					
Professor	0.7	0.7				Professor	0.3	0.3			
Associate Professor	0.7	0.7				Associate Professor	0.3	0.3			
Senior Lecturer						Total	0.6	0.6			
Lecturer											
Demonstrator	**1.0**	1.0									
Total	**3.0**	3.0									
2010 EFTSL/Staff	**6.4**										

Table 7 continued

Teaching Positions	Total	Funding Source			Field of Term Appointment	Research positions	Total	Funding Source			Field of Application of Term Position - funding source
		University		External				University		External	
		Perm.	Term Position					Perm.	Term Positions		
	FTE	FTE	FTE	FTE			FTE	FTE	FTE	FTE	
Curtin University (Applied Geology & Exploration Geophysics Departments)						**Curtin University**					
Professor	5	5				Professor	1	0.5		0.5	Rock Physics CSIRO
Associate Professor	6	6				Profesorial Fellow	2		1	1	Sedimentology, Geochronology
Senior Lecturer	3	3				Prin. Research Fellow	3.1	1		2.1	Exp Rock Physics
Lecturer	2	1	0.95			Snr Research fellow	5.8	0.5	4.5	0.8	Hard rock, Structure, Fluid-rock, Geochron. Hydrogeophys.
Snr Res Fellow Teaching	2	0.5	1.5			Research Fellow	9	1	4	4	(Structure, Geochron, Sedimentology, Metamorphic
Total	18	15.5	2.45	0		Total	20.9	3	9.5	8.4	Instrumentation, software, exp rock phys, seismic proc)
2010 EFTSL/Staff	**19.83**					Note: 2 man year of SRF time is involved in teaching and is transferred to Teaching Positions					
Flinders University						**Flinders University**					All Surface water Hydrology
Professor	1	1				Professor	4	1		3	CSIRO
Associate Professor	2	2				Profesorial Fellow					
Senior Lecturer	2	2				Prin. Research Fellow					
Lecturer	1		1			Snr Research fellow	4		1	3	CSIRO
Demonstrator						Research Fellow	5		5		
Total	6	5	1			Total	13	1	6	6	
2010 EFTSL/Staff	**16.5**										
James Cook University						**James Cook University**					
Professor	4.5	4.5				Professor	1			1	Geochemistry
Associate Professor	2.5	2.5				Snr Research fellow					
Senior Lecturer	1	1				Research Fellow	4		4		?
Lecturer	2.5	2.5				Research Associate	1		1		?
Demonstrator	0.5	0.5									
Total	11	11				Total	6	0	5	1	
2010 EFTSL/Staff	**7.8**										
La Trobe University											
Professor						No Research positions					
Associate Professor	1.0	1									
Senior Lecturer											
Lecturer	0.5		0.5		Casual						
Demonstrator	0.1		0.1		Casual						
Total	**1.6**										
2010 EFTSL/Staff	**23.2**										
Macquarie University						**Macquarie University**					
Professor	2	2				Professor	1	1			
Associate Professor	2	2				Prin. Research Fellow					
Senior Lecturer	5	5				Snr Research fellow					
Lecturer	2	1	1			Research Fellow	2	2			
Total	11	10	1	0		Research Associate					
2010 EFTSL/Staff	**10.0**					Total	3	3	0		

Table 7 continued

Teaching Positions	Total	Funding Source			Field of Term Appointment	Research positions	Total	Funding Source			Field of Application of Term Position - funding source
		University		External				University		External	
		Perm.	Term Position					Perm.	Term Positions		
	FTE	FTE	FTE	FTE			FTE	FTE	FTE	FTE	
University of Melbourne						**University of Melbourne**					
Professor	3	3				Professor	1.5		1.5		
Associate Professor	4	4				Professorial Fellow	4.4		0.1	4.3	ARC/ Contract research/Industry
Senior Lecturer	0.25	0.25				Prin. Research Fellow				0	ARC various
Lecturer	2	1	1			Snr Research fellow	1			1	ARC Future Fellow Atmospheric science
Demonstrator	0.75		0.75			Research Fellow	8.45		1	7.45	var
Total	10	8.25	1.75			Research Associate	10.25			10.25	var
2010 EFTSL/Staff	**12.5**					Total	25.6	0	2.6	23	
Monash University						**Monash University**					
Professor	2.7	2.7				Professorial Fellow	2			2	ARC Linkage; Industry - Basin Analysis; Geophysics
Associate Professor	2	2				Snr Research fellow	3		1	2	ARC Linkage - Basin Analysis; Geophysics; Ore Deposit
Senior Lecturer	2	2				Research Fellow	6		2	4	ARC linkage-Geodynamics
Lecturer	4	1	3			Research Associate	1		1		Paleontology
Total	10.7	7.7	3	0		Total	12	0	4	8	
2010 EFTSL/Staff	**16.89**										
University of New England						**University of New England**	(no positions)				
Senior Lecturer	1	1									
Lecturer	1.5	1	0.5								
Total	2.5	2	0.5								
2010 EFTSL/Staff	**21.2**										
University of Newcastle						**University of Newcastle**					
Professor	1			1							
Associate Professor	2	2				Research Fellow	4			4	Climate Res, Hydrogeology - ARC, Council, Various
Senior Lecturer	1	1				Research Associate	0.5	0.5			
Lecturer	4.6	4.6									
Total	**8.6**	7.6		1		Total	4.5	0.5		4	
2010 EFTSL/Staff	**18.0**										
University of New South Wales						**University of New South Wales**					
Professor	1	1				Professor	1	1			Natural hazards
Associate Professor	4	4				Professorial Fellow	1	1			Geomorphology, Regolith & Landscape Evol (approx)
Senior Lecturer	6	6				Senior Research Fellow	1			1	Hydrogeology
Lecturer	1	1				Research Fellow	1		0.5	0.5	Natural Hazards
Demonstrator		0									
Total	12	12	0	0							
2010 EFTSL/Staff	**16.7**					Total	4	2	0.5	1.5	

Table7 continued

Teaching Positions	Total	Funding Source			Field of Term Appointment	Research positions	Total	Funding Source			Field of Application of Term Position - funding source
		University		External				University		External	
		Perm.	Term Position					Perm.	Term Positions		
	FTE	FTE	FTE	FTE			FTE	FTE	FTE	FTE	
University of Queensland						**University of Queensland**					
Professor	4	3				Professor					
Associate Professor	2	1				Professorial Fellow	1			1	NCRIS
Senior Lecturer	2.6	2.6				Prin. Research Fellow	1			1	NCRIS/Industry
Lecturer	2		2			Snr Research fellow	1			1	NCRIS
Demonstrator	2					Research Fellow	4			4	NCRIS/ARC
Total	12.6	6.6				Research Associate	7			7	NCRIS/ARC
2010 EFTSL/Staff	**11.3**					Total	14			14	
Queensland University of Technology						**Queensland University of Technology**					
Professor	0.5	0.5									
Associate Professor	1	1				Senior Researh Fellow	1	1			Basin Evolution
Senior Lecturer	1	1				Research Fellow	3	3			Groundwater
Lecturer	4	4									
Total	6.5	6.5	0	0		Total	4	4			
2010 EFTSL/Staff	N/A										
RMIT University						**RMIT University**					
Professor	**0.5**	0.5				Professor	0.5	0.5			
						Research Fellow	1			1	Sensor design - inustry
Demonstrator	**0.2**			0.2		Research Associate	0.5			0.5	Modelling - Industry
Total	**0.7**	**0.5**	**0.0**	**0.2**		Total	2			**1.5**	
2007 EFTSL/Staff	**4.3**										
University of Sydney						**University of Sydney**					
Professor	4	3		1		Prin. Research Fellow	1			1	
Associate Professor	5	5				Snr Research fellow	1			1	Marine Geoscience - UNEP
Senior Lecturer	5	5				Research Fellow	3			3	Tectonics - ARC
Lecturer	3	3				Post Doc/Fellow	2			2	Tectonics - ARC
Demonstrator						Research Associate	1.5			1.5	Tectonics-ARC-Industry
Total Geoscience	**17**	**16**		**1**	(Note geography teaching staff ommitted)	Total geoscience	8.5			8.5	Tectonics - industry; Phys geog - RIRDC
2010 EFTSL/Staff	**8.1**					Total All	9.5				(Note Human geographer omitted)
University of Tasmania						**University of Tasmania**					
Professor	5.5	5		0.5	Geology	Professor	2		2		Geochemistry and Geology
Associate Professor	2	1.5		0.5	Geology	Prin. Research Fellow	2			2	Geochemistry & Geology - ARCCOE & Industry
Senior Lecturer	5	4		1	Geology	Snr Research fellow	8.5			8.5	Geochemistry & Geology - ARCCOE & Industry
Lecturer						Research Fellow	6			6	Geochemistry & Geology - ARCCOE & Industry
Demonstrator						Research Associate					
Total	12.5	10.5	0	2		Total	18.5		2	16.5	
2010 EFTSL/Staff	**6.59**										

Table 7 continued

Teaching Positions	Total	Funding Source			Field of Term Appointment	**Research positions**	Total	Funding Source			Field of Application of Term Position - funding source
		University		External				University		External	
		Perm.	Term Position					Perm.	Term Positions		
	FTE	FTE	FTE	FTE			FTE	FTE	FTE	FTE	
University of Technology Sydney						**University of Technology Sydney**		(no positions)			
Professor	1	1									
Associate Professor											
Senior Lecturer	1	1									
Lecturer											
Demonstrator											
Total	2	2	0	0							
2010 EFTSL/Staff											
University of Western Australia						**University of Western Australia**					
Professor	4.5	4.5				Professor	1.5	0.5		1	Quat Sci - Premier's Fellowship; Num Geophysics - CSIRO
Associate Professor	5	4		1	Mineral Geoscience	Professorial Fellow	2.65			2.65	Min Econ - CET; Geotherm-CoE,CSIRO; Imag Anal;
Senior Lecturer	4.15	3.9	0.25			Prin. Research Fellow					Stud'l Geol-CET
Lecturer	4.4	1.5	1.9	1	Mineral geophysics and geology (1st yr coord)	Snr Research fellow	2.75			2.75	Min Geosci-CoE; Geotherm -CoE; Num Geophys - CSIRO
Demonstrator						Research Fellow	17			17	10 Min Geosc-CET; Paleo-ARC; Num Geophys-ARCDP;
Total	18.05	13.9	2.15	2		Research Associate	1.5	1	0.3	1.2	Geotherm-CoE; Pet Geo-Dept Mines;
2010 EFTSL/Staff	**7.6**					Total	25.4	1.5	0.3	24.6	Tectonics, Min Deposits - ARC, CoE
University of Wollongong (geoscience)						**University of Wollongong** (geoscience)					
Professor	5	1				Professor	1				
Associate Professor	3	3				Senior research Fellow	1				
Senior Lecturer						Research Fellow	1				
Lecturer	2	1				Res Assoc	2				
Demonstrator											
Geoscience Teaching	10	5				Geoscience Research	5				
Total Teaching Staff	**16.0**					Total Res Staff	18				
2010 EFTSL/Staff	10.81										
National											
Total	**256.55**	**201.65**	**30.81**	**11.43**			**182.6**	**14.6**	**24.9**	**138.6**	
Overall EFTSL/Staff	**9.6**										

Attachment: Australian Geoscience Tertiary Education Profile - Questionnaire

Institution:
Parent Department/School:

A. Current Geoscience Undergraduate Educational Offerings:

1. Are you able to teach an undergraduate major and/or honours in geoscience? (if no go to question 2)

   a) If a major is offered are there prescribed options? Eg Give titles

   b) In what areas are honours thesis topics typically available from your department? Use the 2008 ABS Research Classification Codes (attached) to describe.

2. If geoscience is offered as part of a more general science degree or part of another subject major give general course titles on offer.

3. Do you have arrangements with other institutions to deliver geoscience courses?
   - give institutions and general course titles.

4. Given the well recognized skills gaps of many graduates in areas of geoscience related to industry and the work of public institutions (e.g. aspects of geophysics, minerals, petroleum and quantitative geoscience) have any specific actions been taken in the last 3 years to address these skills gaps in courses up to and including Honours level?

5. Are there any changes that will affect undergraduate offerings in the next three years?

6. Does your department have an outreach/liaison program to stimulate interest in geoscience in the broader community and to interest potential students in geoscience?

B. Current Post Graduate Offerings

1. Are you able to offer MSc degrees in geoscience

   a) If an MSc is offered are there proscribed options eg Give titles

   b) In what areas are MSc thesis topics typically available from your department? Use the 2008 ABS Research Classification Codes (attached) to describe.

2. Are you able to offer PhD degrees?

   a) In what geoscience research areas PhD topics available in your department? Use the 2008 ABS Research Classification Codes (attached) to describe.

3. Given the well recognized shortage of graduates in areas of geoscience related to industry (e.g. aspects of geophysics, petroleum and minerals geoscience) have any specific actions been taken in the last 3 years to address these skills gaps in post graduate courses?

4. Are there any changes that will affect postgraduate offerings in the next three years?

C. Staffing Profiles and General Resourcing

1. Please give your geoscience staffing profile in the recent past and currently.

a) University and externally funded Teaching Positions,

Level	Total	University Funded		Externally Funded		
	FTE 31 Dec 2010	Permanent FTE	Term Appointment FTE	FTE	Duration	Field of Application
Professor						
Associate Professor						
Senior Lecturer						
Lecturer						
Demonstrator						

b) University funded Research positions

FTE	31 Dec 2010	Field of Application	Duration
Professor			
Professorial Fellow			
Principle Research fellow			
Senior Research Fellow			
Research Fellow			
Research Associate			

c) Externally-funded Research Positions, Professor/Professorial Fellow, Research Fellow etc

FTE	FTE 31 Dec 20010	Source of Funding	Field of Application	Duration
Professor				
Professorial Fellow				
Principle Research fellow				
Senior Research Fellow				
Research Fellow				
Research Associate				

10 Have you experienced any changes to your university-funded staffing profile over the past five years? If so, what have these changes been?

11 Do you anticipate any changes to your staffing profile in the next three years?

12. Please provide comment on the change in teaching load of staff over the past five years.

13. Please provide a comment on resourcing issues which is affecting the quality of the educational experience eg physical facilities and equipment, adequacy of support staff, opportunities for fieldtrips etc.

14. Does your Department receive any direct or in-kind support from industry or government science agencies for equipment or other infrastructure?

a) Cash support :

b) In-kind support (including topics and support for student theses

D. Geoscience Graduate Output

15. Please complete the following tables to enable a national perspective on geoscience graduate trends. In order to provide comparable data between institutions we would appreciate if you could you could provide numbers of students in specific geoscience course subjects and give the Fraction of Full Course Load to allow calculation Equivalent Full Time Student Load (EFTSL = student enrollment x fraction of load for each subject) in all subjects at each year level.

Undergraduates - INCLUDE ONLY GEOSCIENCE COURSES

Year Level - Geoscience Course	Fraction of full course load	2010 No's	2009 No's	2008 No's
Year 1				
Year 2				
Year 3				
Year 4 – Honours				

Geoscience Post graduates – completed degrees

Degree - Specialty Area Use ABS Research Classification Code to describe	2010 No's	2009 No's	2008 No's
MSc			
PhD			