Australian Geoscience Council Inc.

The Council of Earth Science Societies in Australia

AGC

AUSTRALIAN GEOSCIENCE TERTIARY EDUCATION PROFILE 2012

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SUMMARY

The Australian Geoscience Tertiary Education Profile 2012 (AGTEP 2012) reports the results of a survey of geoscience at Australian universities. It complements similar surveys undertaken in 2007 and 2010. It provides a stocktake for the end of 2012 of Tertiary geoscience education in Australia and the general capabilities of Tertiary geoscience institutions.

The status of geoscience and geoscience education has continued the improvement recorded in 2010 with further growth in enrolled students, reversing the decade-long decline prior to 2007. The output of Bachelor (BSc) degrees with a major in geoscience has continued to grow, but Honours enrolments and the output of BSc Honours degrees have declined slightly from 2010. The output of Masters (MSc) degrees by coursework and dissertation, have continued to grow strongly. The number of teaching academics has increased slightly since 2010, and the number of researchers has also increased.

Eighteen universities (up from 17 in 2010) 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, six maintain distinct geoscience schools, but with one of these about to undergo a merger with non-geoscience schools. In the remainder, the geoscience discipline is variously amalgamated into schools of 'earth, geography, environmental and biological 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 environment courses and traditional 'solid earth science' courses. Others have maintained a clear distinction between degree types.

Geoscience is still being taught as a component of 'environmental science degrees' at La Trobe and to a lesser extent at University of Technology Sydney. At RMIT University, an Honours course in Physics-Geophysics with a focus on technology 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. Nine universities participate in the Minerals Shortcourse Program at Honours underwritten by the Minerals Tertiary Education Council (MTEC).

All institutions offer MSc/MPhil by research, but there are a substantial and growing number of 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, but are also offered as pre-research training. Three universities (James Cook, Tasmania and Western Australia) cooperate in the MTEC Mineral Masters program. The universities of Melbourne and Macquarie now offer a 2-year Masters by coursework and dissertation in lieu of an Honours Degree, with Adelaide introducing this option in 2014. Western Australia has this option predominantly for overseas students and retain the Honours and 1-year Masters predominantly for domestic students.

The National Centre for Groundwater Research and Training was established in 2009 'to improve our understanding of Australia's Groundwater Systems, and by training the next generation of expert researchers and groundwater professionals. It is an ARC Centre of Excellence co-funded by the National Water Commission.

Based at Flinders University with eleven university partners, it does not produce graduates in its own right but strengthens the capacity of the university partners in this regard.

Similarly the ARC Centres of Excellence in 'Ore Deposits' and 'Core to Crust Fluid Systems' centred at the Universities of Tasmania and Macquarie respectively strengthens their capacity and of that of their university partners.

In addition to normal curriculum reviews, several universities continue to take specific steps to meet the needs of potential employers by addressing the core skills requirements of graduates:

- 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 strengthened some disciplines including geophysics, field geology, digital geology, minerals geoscience and petroleum geoscience.
- placements in industry as part of a course of study.
- provision of specific options and specializations in majors and MSc degrees

Universities in Victoria and Sydney cooperate in the delivery of Honours years electives in the respective locations.

Nationally student enrolments, as measured by Equivalent Full Time Student Load (EFTSL), have increased 14% since 2010 continuing the growth recorded in the 2010 survey. This growth is not universal with six universities static or showing declines.

Contrary to the survey covering 2007-2010, Honours enrolments have stabilized or declined slightly in most universities although a few are still growing. This has led to an overall slight decline in Honours enrolments from 2010.

There is also a wide variation in student load. Two universities (Adelaide and Curtin) account for 27 percent of the national student load with EFTSL values of 300 or more. Four universities have values between 200 and 250. The balance has values below 180, of which six are below 100. All universities have increased their total EFTSL since 2010.

The output of BSc degrees with a major in geoscience was approximately 690 in 2012 and includes an estimate for the schools that have not reported. This is consistent with the growth in enrolments at Level 3. Similarly the output of BSc Honours degrees was approximately 241, slightly less than that recorded (251) in 2010.

The decline in output of MSc/MPhil degrees has continued and is now only about 10 per annum, whilst the output of MSc degrees based on coursework and a dissertation has seen a further dramatic increase to around 100. It has more than doubled since 2010 following an increase by 250 percent in 2010 compared with 2007.

The output of PhD degrees recorded a drop of 20 percent to about 66 in 2011 before rebounding to 95 in 2012.

In 2012, 200 academic staff were engaged in some level of teaching of geoscience in Australian universities whilst there are a further 270 staff engaged in research with no formal teaching commitments. The numbers in 2010 were 256 and 177 respectively. The dramatic difference represents a further change in reporting of the balance between teaching and research staff at the ANU following their merger of departments. Removing the ANU from the totals shows that nationally since 2010 there has been a decrease of four teaching staff (a loss of 2% compared with an increase of 13% between 2007 and 2010) whilst the number of research positions has increased by 35 (22 % compared with 13% between 2007 and 2010). The loss of 8 positions from the geoscience teaching staff at University of Tasmania as it undergoes a renewal and restructuring program shows that 4 positions have been added elsewhere.

In 'geoscience' schools there are now, 7 schools (8 in 2010) with more than 12 teaching positions, 7 (5 in 2010) with 8-12 teaching positions and 5 (4 in 2010) with less than 8 teaching positions.

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

The survey shows that universities vary widely in their viability as geoscience teaching institutions. There has been a general strengthening of 'geoscience schools' as student numbers have increased and courses re-organised to improve the efficiency of teaching. From 2007, there has been a systematic increase in the EFTSL per teaching staff member with now 6 universities above 20, 5 between 15 and 20 and only 1 below 10. This indicates improving financial viability for many schools. The growth in MSc degrees involving significant coursework also impacts on teaching loads and contributes to financial viability for those departments where this is occurring.

There is evidence of considerable effort to meet the work force requirements of graduates both at the undergraduate and MSc levels. The static nature of the PhD output over several years 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 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.

In general the position has improved again since 2010, but it remains clear that a critical mass of teaching and research capability that creates a vibrant and attractive educational experience is fundamental to sustaining Tertiary geoscience educational opportunities in Australia. This survey has shown again that some larger schools with wide capability are growing from strength to strength, whilst others with lesser capability are static or reducing.

A major future threat is the impact of the mineral industry downturn on the attractiveness of geoscience to students and, in turn, the financial viability of some geoscience schools if student numbers fall substantially.

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[1] [2]. In response to this concern the Australian Geoscience Council (AGC) undertook surveys in 2007 and 2010 of Australian universities to establish an Australian Geoscience Education Profile and a health check on our national geoscience teaching capability. The results of these surveys and an accompanying commentary were compiled into the reports Australian Geoscience Tertiary Education Profile (AGTEP) 2007 and 2010 and were released in 2008 and 2011 respectively[3].

The resources boom in the 2000's enhanced geoscience employment opportunities and resulting in a skills shortage in industry. During the Global Financial Crisis there was a dip in geoscience employment, but with the resumption of the resources boom the industry skills shortages had re-emerged. A measure of the shortage of the geoscientist in the resources industry in 2010 was 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). AGTEP 20007 and 2010[3] showed increased enrolment in geoscience and growth in geoscience staffing at Australian universities in response to these employment opportunities. However by late 2012 the resources boom had subsided and evidence from the Australian Institute of Geoscientists in 2013[4] has indicated that geologists have been laid off in the minerals and coal sectors.

Given this situation, it is timely for the survey to be repeated and for AGTEP to be updated. AGTEP 2012 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.

[1] Mineral Council of Australia, Back from the Brink: Reshaping Minerals Tertiary Education, MCA National Tertiary Education Taskforce, MCA, Canberra 1998.
[2] National Committee for Earth Sciences, National Strategic Plan for the Geosciences, Australian Academy of Science , Canberra 2003.
[3] Australian Geoscience Tertiary Education Profile 2007, January 2008; Australian Geoscience Education Profile 2010, August 2013. www.agc.org.au/reports
[4] Australian Institute of Geoscientists Employment Survey
http://www.aig.org.au/index.php?option=com_content&view=article&id=312&Itemid=339

- Obtain indications of the viability of earth science at Australian Tertiary Institutions and their capability

UNIVERSITY GEOSCIENCE IN 2007- 2010

As a result of AGTEP 2007 and 2010[3] the AGC identified the changes relating to geoscience in Australian universities during that time.

- The declining status of geoscience in Australia identified in 2007 had improved substantially by 2010 with a marked growth in enrolled students and academic teaching staff reversing the decade long decline to 2010.

- In 2007 insufficient funding of teaching in universities and the funding model were an issue.

    - New funding measures for teaching and learning were introduced to universities commencing with the 2009 budget and growing during the then forward estimates period with a long-term commitment over the decade. This commitment was reduced by the Gillard Government in the 2013 budget.

    - The 2010 survey showed that the financial position of geoscience departments had improved largely through higher enrolments, mergers of departments and remodeling of degree programs, but there was an emerging financial threat from the decline in PhD students.

- In 2007 lack of awareness of geoscience in our secondary schools was an issue.

    - this was 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. This remains an issue for the longer term, but the improved enrolments in geoscience in response to the resources boom suggests that perceptions of job opportunities is the major driver of interest in geoscience.

- In 2010 the decline PhD students was a concern as was the replacement of academic staff as the 'baby-boom' generation retires.

- The recruitment strategies and cyclical nature of the resource industries remained a major concern. Again this is evident from current industry downturn.

The Minerals Council of Australia[5] in 2008 reviewed the capability 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,

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

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 thirdly the age profile of academic staff with specialist interests related to mineral geophysics.

Attracting Students into Geoscience

Geoscience has been variously included in State school curricula for many years. However industry demand for geoscientists and geoscience community concerns over the declining status of geoscience in universities identified the need for enhanced exposure of school students to geoscience. Governments have been lobbied accordingly. The aim has been 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. The Western Australian (WA) Government through the State Curriculum Council has been particularly active in this regard in revising its active geology curriculum by introducing a new course in Earth and Environmental Science (EES) in year 11-12 in 2007. EES is also being introduced in Year 8-10 science courses and to enrich other Year 11-12 science courses.

An important supporting strategy by the geoscience community has been to help teachers to deliver earth science by development of new teaching resources and associated training, and in states like South Australia and Tasmania, to advocate the availability of EES courses. Two important initiatives have been developed.

Earth Sciences WA[6] has been developed in Western Australia with a top priority of enabling geoscience teaching in secondary schools following the introduction of the new curriculum in 2007. It has included work on professional development for teachers and development of classroom and field materials in conjunction with the WA Curriculum Council. In early 2011, ESWA released an EES Textbook that directly reflects the Western Australian EES Curriculum and encompasses the essential components of the National Curriculum for EES in the Senior Years. This EES text is tailored to the WA context and uses examples that are relevant to WA students and teachers.

[6] www.earthsciencewa.com.au

From 14 schools teaching EES to just over 200 students in 2007, numbers have risen to nearly 30 schools teaching over 800 students in 2012. 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 to support the programme.

The ***Teacher Earth Science Education Program (TESEP)***[7] has been 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 beyond WA.

It comprises 'The Challenging Earth' series of Professional Development workshops for science teachers who teach Years 7 to 10. TESEP has given 114 workshops with 1360 teacher attendances in over 24 urban and rural locations in all states and territories except WA. Current special projects include the development of case studies for the eastern states as a supplement to the WA EES Textbook so that it has national coverage, webinar development and presentation and field guides for teachers. The programme is delivered by professional teachers under the auspices of the Australian Science Teachers Association.

As part of its schools educational initiative, the Labour 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 as course option in Years 11/12. The National Curriculum was to be progressively introduced from 2012 onwards. The practical implementation of this measure has been delayed and perhaps with not the impact that had been hoped for with State Governments modifying the proposals to suit their own systems and with a different approach to be adopted by the incoming Coalition Federal Government

However, it remains in the geoscience professions' interests that curriculum materials are available and that training opportunities are available for teachers. In this light, the ESWA and TESEP initiatives assume critical importance.

METHOD

A questionnaire (Attachment A) updated from 2007 and 2010, formed the basis of this survey – see Appendix. For the first time, data on BSc degrees awarded from 2007 to 2012 was requested. Twenty-four university schools were identified as having some geoscience teaching or research capability. An invitation was sent to the heads of schools in early May 2013 inviting them to complete the questionnaire. Responses have been received from all but three schools at the Sydney, Newcastle and Flinders Universities. 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.

[7] www.tesep.org.au

The results of the questionnaire were supplemented by examination of the various university web sites of the school structures, staffing and course options available to students. This enabled some, but not all incomplete data sets to be enhanced. Where national totals would be affected by instances of non-reporting, 2010 values were used to complete the data sets. Notes are provided on incomplete data sets in the Tables.

In schools where geoscience occurs along with other disciplines, it is sometimes difficult to ascertain the true numbers of staff engaged in geoscience. As a rule staff covering the disciplines in Division Geoscience 04 from the Australian and New Zealand Standard Research Classification ABS 2008 (see Attachment) were included.

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 the course represents for a full work load in a given year or level.

EFTSL values for particular courses range 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 the financial viability of the teaching programmes. Post – graduate courses are not counted here, but can be important contributors to the viability of the 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.

In the current survey, data was collected on the number of Geoscience Major and Honours degrees awarded since 2007 in order to complement the data of MSc and PhD degrees.

The results are presented in the following Tables.

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 the Minerals Tertiary Education Council.

Table 4 Profile of capability at Australian universities to supervise geoscience theses.

Table 5 Enrolment data for undergraduate geoscience courses at Australian universities

Table 6 Completed degrees in earth science at Australian universities

Table 7 Teaching and research positions in earth science at Australian universities at the end of 2012.

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

Adelaide or Adel	University of Adelaide
ASP	Australian School of Petroleum, University of Adelaide
ANU	Australian National University
Ballarat or Ball	University of Ballarat
Canberra or Canb	University of Canberra
Curtin or Curt	Curtin University, WA
Flinders or Flind	Flinders University, Adelaide
JCU	James Cook University
La Trobe or LaTr	La Trobe University
Macquarie or M'qua	Macquarie University, Sydney
Melbourne or Melb	University of Melbourne
Monash or Mon	Monash University, Melbourne
Newcastle or Newc	University of Newcastle
QUT	Queensland University of Technology
RMIT	RMIT University
Sydney or Syd	University of Sydney
UTAS	University of Tasmania
UNE	University of New England
UNSW	University of New South Wales
Queensland or Q'SL	University of Queensland
QUT	Queensland University of Technology
UTS	University of Technology Sydney
UWA	University of WA
Wollongong or Woll	University of Wollongong

RESULTS

Institutional Status of Geoscience and Geoscience Degrees

Eighteen universities have the capacity to teach geoscience as a major in their undergraduate programs. (Table1). This is an increase by one over 2010 where an Earth Science Major is now available at Canberra with a focus on landscape, soils regolith and geochemistry. An additional university, Flinders, offers an earth science major as part of an environmental degree.

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

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

- La Trobe, UTS

RMIT offers an Honours degree only in Physics (Geophysics) with a technology focus.

The position of the geoscience discipline within the university structures remains very similar to the position reported for 2010, but with restructuring of the school at QUT, where the School of Biogeoscience has been renamed Earth, Environmental and Biological Sciences with a stronger earth science staffing than previously, and at Canberra, where the parent Faculty of Applied Science has been re-structured into the Faculty of Education, Science, Technology and Mathematics.

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 environment - research university, student demand, the funding environment, and search for administrative efficiencies. Some have also taken the opportunity to differentiate themselves through amalgamation of schools and by introducing flexibility into the structure of degrees, particularly related to the environment and natural resource management. This can cause some difficulties in obtaining comparable data on the earth sciences across different institutions. A major re-organisation is pending at UTAS when in 2014 the present School of Earth Sciences will be incorporated into a School of Physical Sciences along with Mathematics, Physics and Chemistry.

Presently, geoscience constitutes a distinct school at ANU, Curtin, Macquarie, Monash, Queensland and UTAS (but see above). 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 ‘biological 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. At Canberra the discipline is in the Faculty of Education, Science, Technology and Mathematics with a link into ‘Teacher Training’ reflecting the need to improve science teaching in schools.

Two universities have two schools dealing with geoscience: Adelaide – School of Earth and Environmental Science and Australian 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 was a general simplification of available options compared with 2007 and this trend is continuing as universities focus on teaching efficiency and maximizing the Equivalent Full Time Student Load (EFTSL) per teaching unit.

The majors offered at Adelaide, ANU, Curtin, JCU, Macquarie, UNSW, Sydney, UTAS and UWA are all based on clear themes related to particular disciplines – e. g. geology, geophysics, hydrogeology, environmental geoscience. However in some schools the electives available make it difficult to identify pure geoscience streams. Degrees are constructed from a selection of courses particularly at Level 3. The choice of courses is also restricted for institutions offering single or perhaps two majors – Ballarat, Flinders, Melbourne Newcastle, UQ, QUT, and Wollongong. The undergraduate course structure is being restuctured at QUT

Two universities (Macquarie and Melbourne) have adopted a 3-2-3 model for geoscience education and research training for domestic students with Adelaide to introduce this in 2014 – 3 year undergraduate major; 2 year Masters (coursework plus dissertation); 3 year PhD. UWA has introduced this option for predominantly overseas student, but has retained the Honours option particularly for domestic students in which case a continuation into Masters involves only one extra year. These changes 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.

The geoscience majors at Wollongong, Flinders and Canberra 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 at Level 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. However it is clear that several schools (Adelaide, Melbourne, Queensland, UWA) have or are strengthening their capability to teach geophysics.

The capability to teach the variety of courses required for a comprehensive geoscience curriculum is dependent upon the availability of teaching staff with the requisite background. As indicated in the 2010 survey, the 'baby boomer' retirement bulge can create some difficulties in this regard and this is an issue reported by some universities with teaching replacements uncertain or some way in the future.

The extent to which coursework is undertaken in the completion of BSc – (Hons) varies - ranging typically from around 25% to around 50% with subject matter requirements also varying considerably between institutions. In general there is a trend to increase course requirements in the Honours year to reflect the skill requirements of potential employers. Nine universities now 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) with a technology focus for students with a physics/engineering major.

Sharing specialist teaching between institutions the Honours level is systematically organized in Victoria and In Sydney.

- The Sydney Universities Consortium of Teaching Geology and Geophysics (SUCOGG)– Honours Course Electives run by the Sydney metropolitan universities.

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

The ARC Centres of Excellence in Earth Sciences also strengthen training as well as research. The National Centre for Groundwater Research and Training (NCGRT) was established in 2009 'to improve our understanding of Australia's Groundwater Systems, and by training the next generation of expert researchers and groundwater professionals. It is an ARC Centre of Excellence co-funded by the National Water Commission. Based at Flinders University with eleven other university partners, it does not produce graduates in its own right but strengthens the capacity of its university partners in this regard which will be reflected in this survey. These are: Charles Sturt University, JCU, LaTrobe, Monash, QUT, ANU, UNSW, Queensland, UWA, University of South Australia, UTS.

The ARC Centre of Excellence in Ore Deposits at UTAS with nodes at Queensland, Melbourne and Queensland uses its wealth of ore body knowledge to provide the tools and techniques to gain a better understanding of specific rock properties and relate these to ore body and halo footprints in a modern mining setting. It is a major source of post-graduate training in mineral exploration and minerals geoscience.

The ARC Centre of Excellence for Core to Crust Fluid Systems (CCFS) commenced mid 2011 with the overarching goal to understand Earth's internal dynamics, evolution and fluid cycles from core to crust and associated research training. CCFS multiplies the capabilities of three national centres of research excellence in Earth and Planetary Sciences: Macquarie (Administering Institution) – GEMOC Key Centre, Curtin – Institute for Geoscience Research and UWA – Centre for Exploration Targeting (Collaborating Institutions) and researchers from Monash and UNSW are formally affiliated.

Several universities have taken specific or planning steps in the last few years to meet the needs of potential employers. Apart from the major changes occurring at Adelaide, Macquarie, Melbourne, QUT and 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 in the process of making) specific teaching appointments in resource geoscience:
  - JCU, Monash, Newcastle, Queensland (industry consultants), UNSW

- they have identified and made (or in the process of making) specific teaching appointments or contracting teaching capability in geophysics:
  - Adelaide, Melbourne, Queensland, UWA

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

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

- provision of specific options and specializations in majors:
  - Adelaide, ANU, UW

Post-Graduate Degrees

Most but not all institutions offer a Master (Phil or Sc) by research, but relatively few are taken up – see below. There are a growing number of MSc degrees being offered by course work combined with a dissertation (Table 1). These degrees are often specifically aimed at training candidates in the knowledge and techniques required for employment in the resources industry, but increasingly as pre-PhD research training where important specialist knowledge can also be acquired. These degrees along with graduate diplomas are also important for geologists already in the workforce to upgrade their knowledge and skills.

Again MTEC offers a Minerals Geoscience Masters Program at three universities – JCU, UTAS, UWA 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.

The NCGRT plays an important role in postgraduate training in groundwater through it university partners.

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.

Not surprisingly the distribution of capability generally follow the teaching profile, initiatives and staff turnover outlined above. Eleven (up from 10 in 2010 following staff recruitments at QUT) of the institutions surveyed (up from 10 in 2010 following staff recruitments at QUT) 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. As mentioned above, geophysics coverage has strengthened since the 2010 survey, but more detailed information would be required to determine if the concerns of the 2008 MCA survey[4] of geophysics have been addressed.

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 very strong and distinct research rationale that the university is willing to support – this is evident in some cases e.g. ANU.

Table 5 gives the Total EFTSL for the surveyed universities for the last 10 years and the main trends are illustrated in Figure 1. The most encouraging feature of this survey is that nationally, the increase in student numbers in Levels 1-3 recorded between 2007 and 2010 has continued into 2012. The overall the number of students has increased by 14% when compared with 2010. In contrast the numbers of students enrolled in Honours has declined by 3% from the 2010. The growth since 2010 has been at Level 1 - 10%, Level 2- 16% and Level 3 – 24% reflecting the

gradual improvement in the Yr3/Yr1 retention rate over the last 3 years compared with previous years (Table 5).

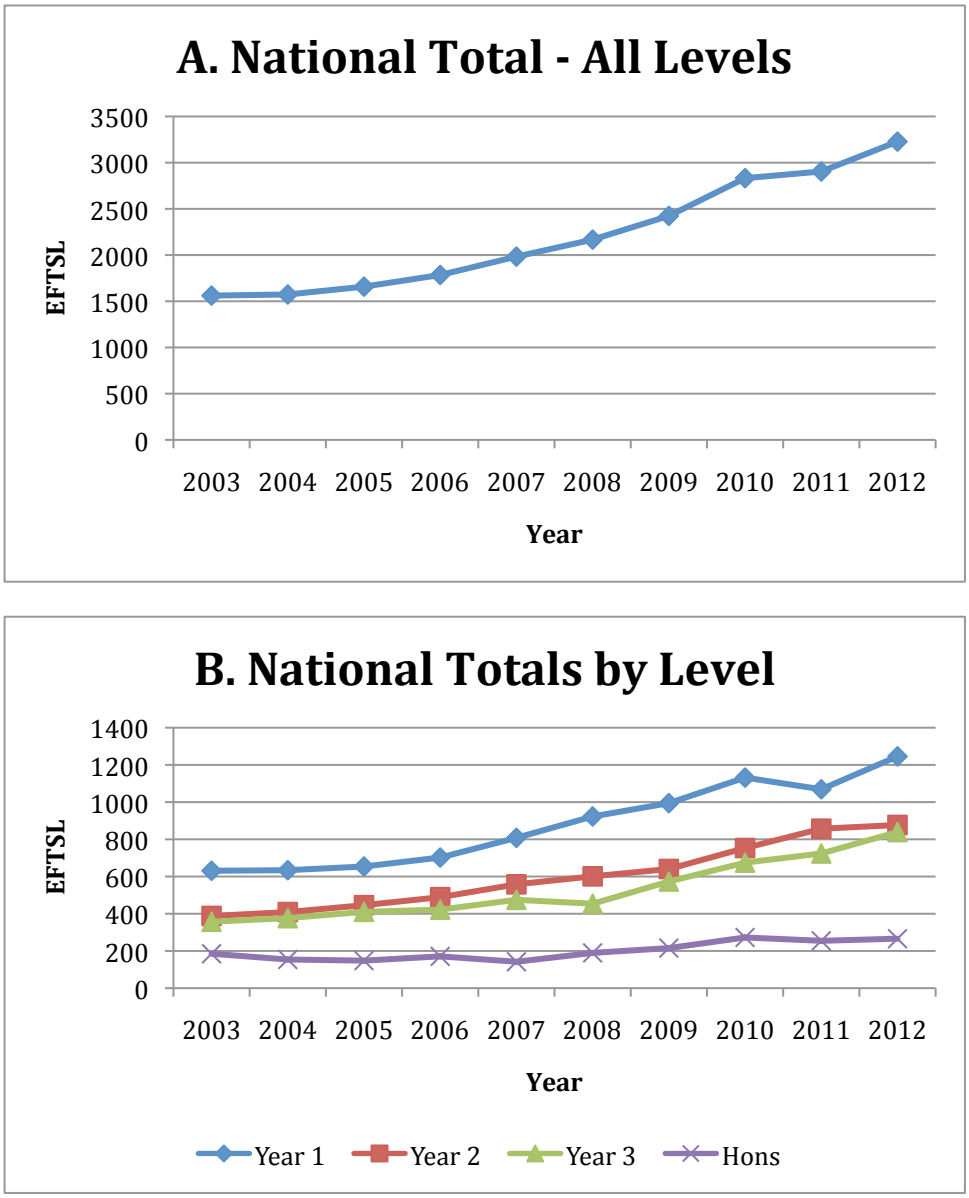
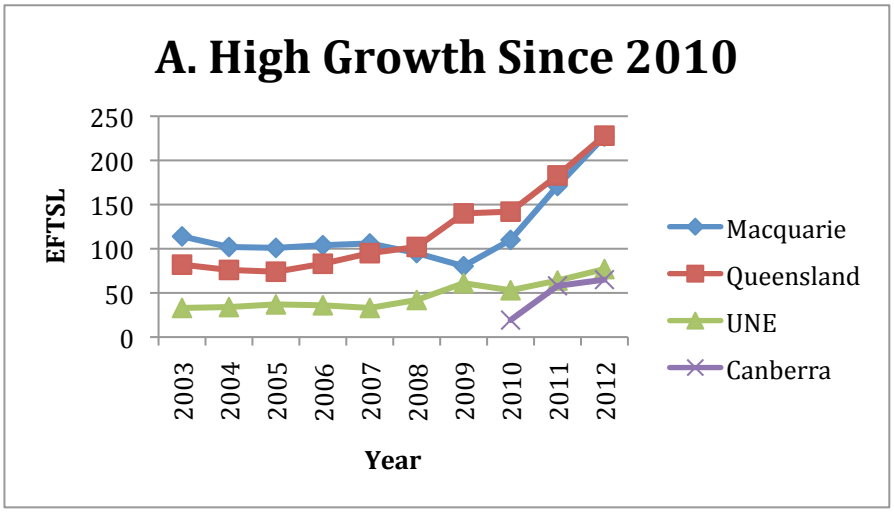
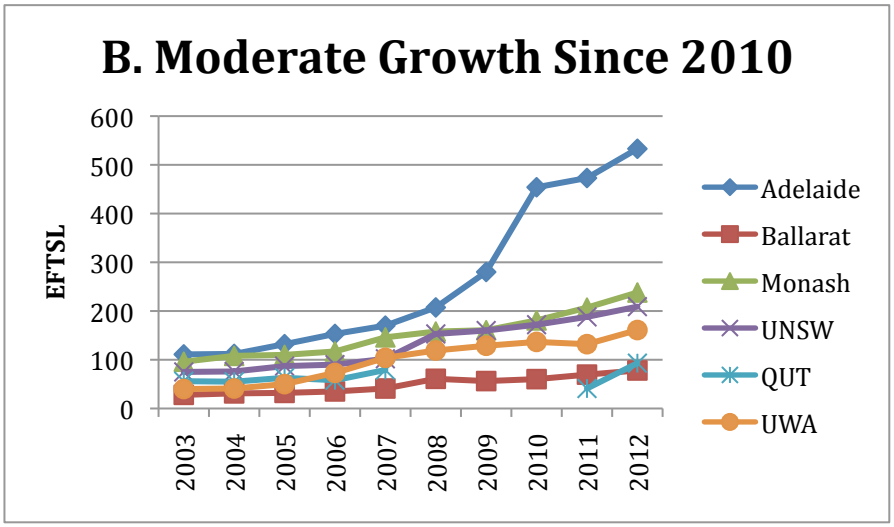


Figure 1 National trends in undergraduate enrolment in the geosciences expressed in Equivalent Full Time Student Load. A. All Levels; B. National Totals by Level.

The trend, however, is not uniform between universities. After a very strong period of growth prior to 2010 the two universities with the highest enrolments – Adelaide and Curtin – have respectively reduced growth or declined (Figure 2). Macquarie (106%) and Queensland (61%), and UNE (45%) have continued to grow strongly in total EFTSL since 2010 (Figure 2A). Canberra enrolments have grown strongly off a low base as it re-establishes some geoscience teaching. Adelaide, Ballarat, Monash, UNSW, QUT and UWA show more moderate growth (17-29% Figure 2B). ANU, and UTAS have static (+/- 5%) enrolments with Curtin, JCU, Melbourne and Wollongong showing reductions (-8 to -18%) (Figure 2C). However both Curtin and JCU continue to show increase enrollments at Level 3 of 19% and 150% respectively.





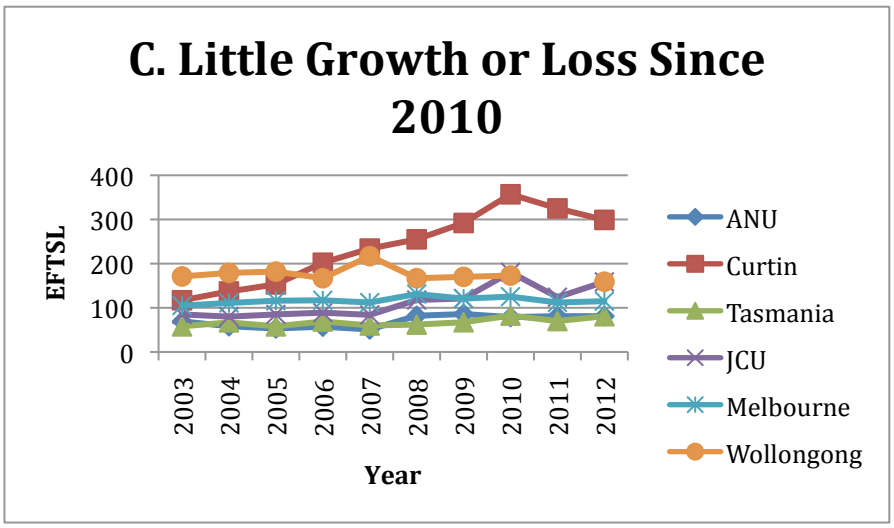
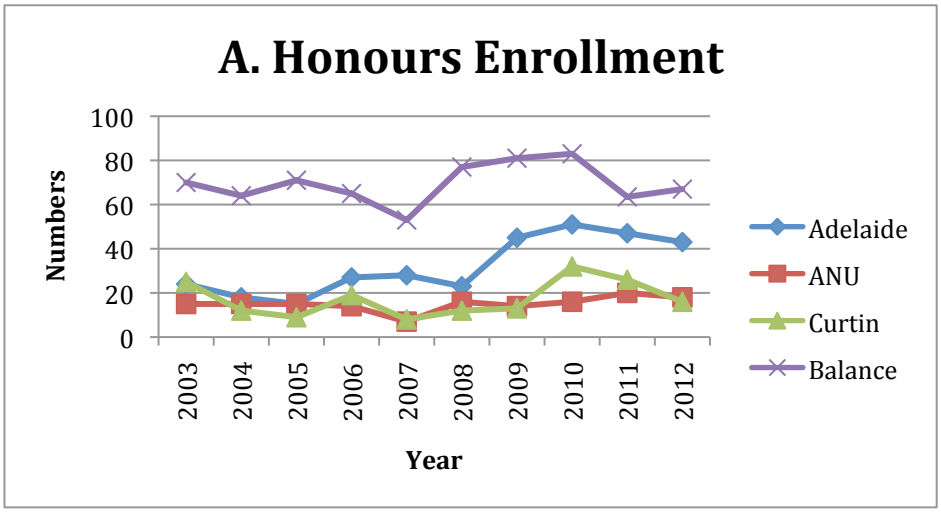
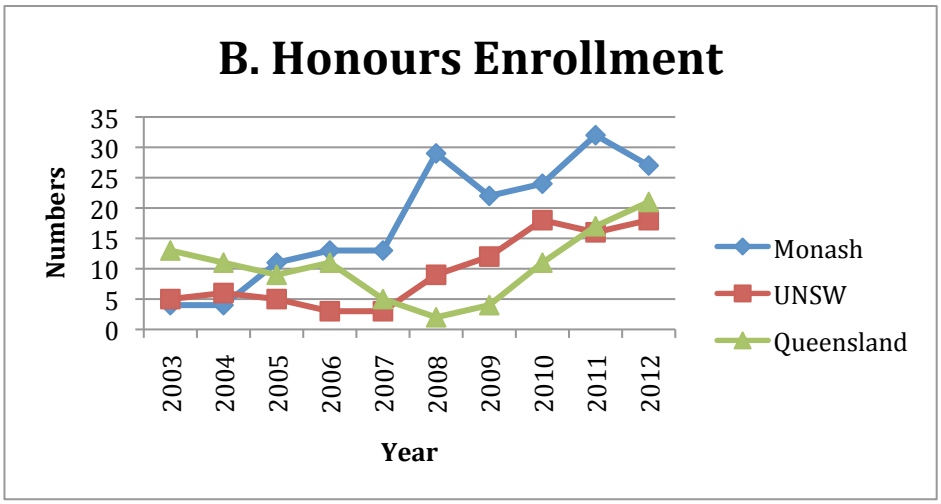


Figure 2. University trends in Equivalent Full Time Student Load (EFTSL) categorised by growth since the last survey in 2010. A. High Growth; B Moderate Growth; C. Little Growth or Loss





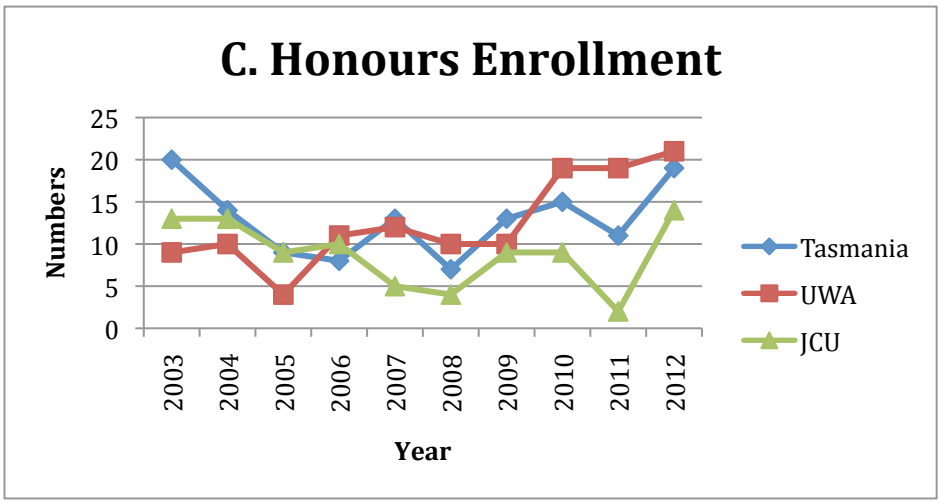


Figure 3. Honours enrolment trends for the 9 universities with the highest Honours enrolments (>13 in 2012) and accounting for 72 percent of the national enrolment compared with the sum of the remainder – Balance.

The schools with the greatest enrolments are Adelaide and Curtin with total EFTSL of over 500 and 300 respectively – representing 27% of the national enrolment - with Macquarie, Monash, Queensland and UNSW recording values over 200 (Figure 2

and Table 5). Melbourne Newcastle, Sydney, UWA and Wollongong had EFTSL values between 100 and 200 and the remainder had values below 100.

Enrolment of students in the Honours year shows a different pattern (Figure 3 and Table 5). Again Adelaide (43) had the highest EFTSL in 2012 followed by Monash (27) and then UWA, Queensland, UTAS, ANU, UNSW (18-21), Curtin (16) and JCU (14). These nine institutions have 72% of the national enrolment at Honours. It is evident from Figure 3 that 2010 was a peak in Honours enrolments in many institutions although two have continued to grow – Queensland and UWA slightly. The decline in Honours enrolments at Melbourne and Macquarie (Table 5) is not unexpected since they are now well into the transition of replacing Honours with MSc coursework degrees.

Most universities currently have large number of students in Level 1. Comparison of the average class sizes in Level 3 with the corresponding class size in Level 1 two years earlier (Figure 4 and Table 5), shows a wide variation in the 'Level 3 Retention Rate' ranging from less than 10% to in excess of 40%. Adelaide, Canberra, Curtin and Wollongong have the highest retentions of over 40% and Curtin Geophysics has over 100% indicating admittances of new students into Level 3. The major metropolitan universities have large classes at Level 1 reflecting that these courses are frequently used as a 'breadth' option for students across the university spectrum so that their retention rates tend to be at the lower end of the range.

A. Level 3 Retention Rate

>40 percent	30-40 percent	20-30 percent	10-20 percent	</= 10 percent
Adelaide Canberra Curtin	Ballarat Wollongong	ANU UNSW UWA National	Macquarie Melbourne Monash Queensland Sydney* UTAS	JCU LaTrobe

B. Honours Retention Rate

>80 percent	50-80 percent	20-50 percent	</=20 percent
ANU UTAS	JCU Macquarie Monash Queensland National	Adelaide Ballarat Curtin Geophysics Melbourne UNSW Sydney*	Canberra Curtin Geology QUT

* denotes 2010 value

Figure 4. Comparison of Retention Rates in 2012: A. Level 3 Retention Rate defined as the average class size at Level 3 in 2012 as a percentage of the average class size in Level 1 two years earlier (2010); B. Honours Retention Rate defined as the class size in Honours in 2012 as a percentage of the average class size in Level 3 one year earlier (2011).

Similarly comparison of the Honours class size with the corresponding class size at Level 3 one year earlier gives the 'Honours Retention Rate' which also shows wide variation. In this case the major metropolitan universities tend to higher retention rates (Figure 4) reflecting their emphasis on higher levels of education and research across the geoscience spectrum. ANU has over 100% retention rate indicating

intake from outside and reflecting its research training emphasis. The progressive replacement of Honours by an MSc degree at Macquarie, Melbourne and UWA affects their positioning by this measure. Similarly, the introduction of a 2-year coursework degree at Curtin Geophysics may have affected its Honours cohort since their 'Honours Retention Rate' has dropped from over 70 percent in 2010 and 2011 to 22 percent (Table 5).

Degrees Awarded

In this survey schools were asked to provide the number of degrees awarded as BSc Major and BSc Honours from 2007 to 2012 (Table 6 and Figure 5).

In 2012 approximately 690 BSc degrees with a major in geoscience were awarded compared with 516 in 2010 and 363 in 2007. This increase reflects the trend in EFTSL at Level 3 noted above. Over the five years reported, the number of degrees is consistently around 80 percent of the EFTSL at Level 3.

In 2012, approximately 241 BSc (Honours) degrees were awarded compared with 251 in 2010 and 157 in 2007. These figures reflect the enrolment trends noted above with the degrees awarded representing around 90 percent of the Honours year EFTSL.

The output of MSc/MPhil degrees by research has stabilized around 10 whilst the output of MSc degrees based on coursework has continued the dramatic increase noted in 2010 (Figure 5 and Table 6) with 100 degrees awarded in 2012. Five universities – Curtin, JCU, Melbourne, Macquarie and UWA – account for 75 percent of these degrees in 2012. JCU and UWA are part of the MTEC Mineral Masters Consortium and Macquarie and Melbourne are substituting Masters degree in lieu of Honours. Curtin, JCU and UWA have an orientation to meeting the requirement of industry and in retraining of industry personnel. Adelaide and UTAS have a similar industry orientation and have had a steady output of MSc degrees by coursework.

In the five years leading up to 2007 the output of PhD degrees had declined and then recovered somewhat by 2010 (Figure 5). In 2012 this rose again to an estimated 90, but 2011 was an anomalously low year of 66 (Table 6 and Figure 5). ANU (16) and Queensland (11) produced the most PhD graduates in 2012 with 5 to 7 being produced from each of Adelaide, Curtin, Monash, UNSW, UTAS, UWA and Wollongong.

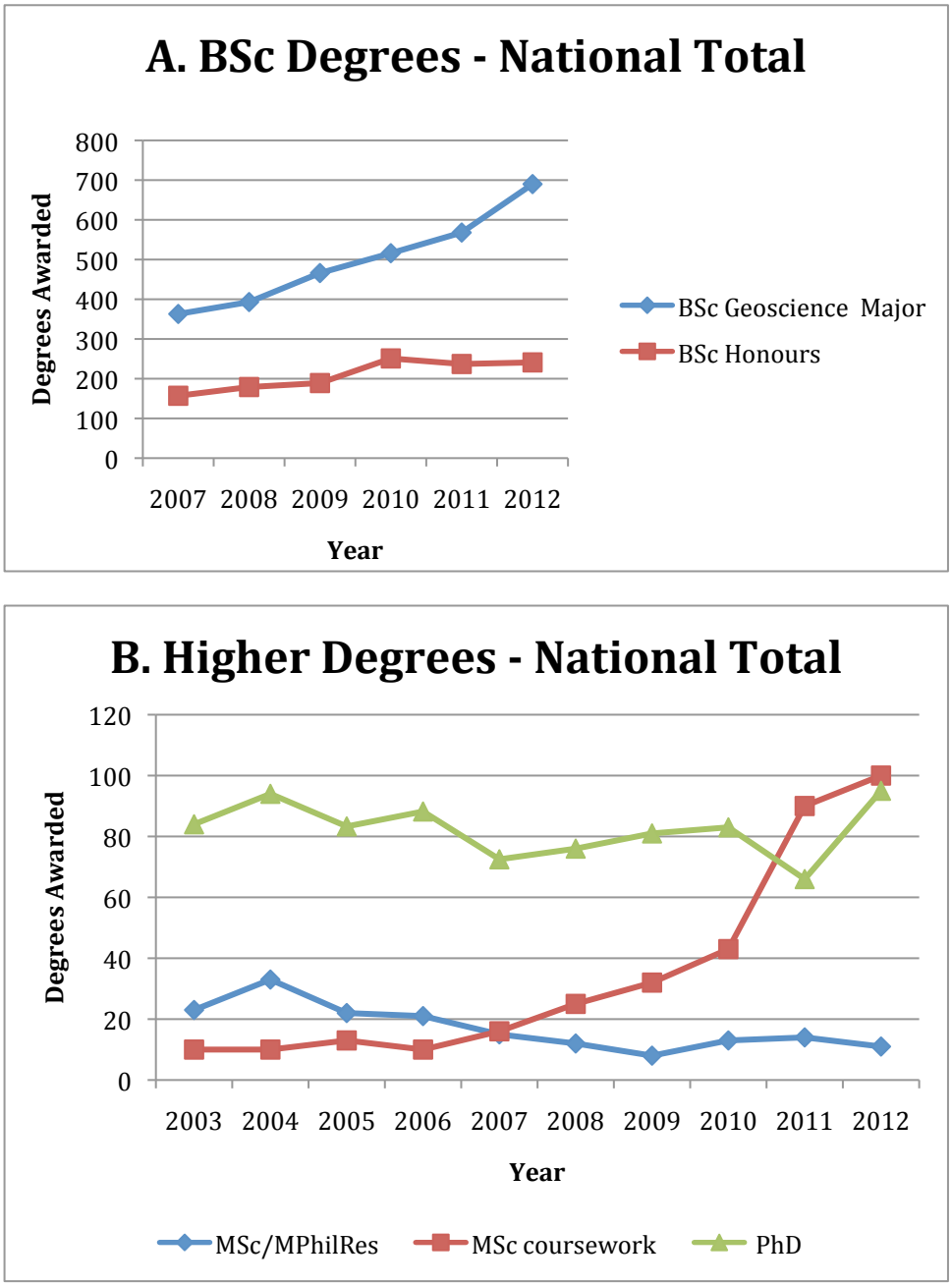


Figure 5. National trends in degrees awarded: A. Bachelor Degrees; B. Higher Degrees.

Staffing Profiles

The long time viability of 'geoscience schools" is dependent upon a combination of both teaching and research. Although the emphasis is placed in this survey 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 6).

In 2012, 200 academic staff are engaged in some level of teaching of geoscience in Australian universities whilst a further 270 staff are engaged in research with no formal or low teaching commitments. The numbers in 2007 were 256 and 182

respectively. The dramatic difference in part represents a further change in reporting from the ANU as the merger of the Research School of Earth Sciences with the Department of Earth and Marine Sciences has evolved. In 2010 teaching responsibilities were reported as being spread amongst formerly pure research staff. In the current survey there are a larger number of research staff than 2010 and teaching is carried out by a small number of academic staff and a large number of demonstrators (21) from the research student cohort. Removing the ANU from the totals shows that nationally since 2010 there has been decrease of four teaching staff (a loss of 2 % compared with a gain of 13% between 2007 and 2010) whilst the number of research positions has increased by 38 (22 % compared with 13% between 2007 and 2010). UTAS alone has undergone a reduction in 8 teaching positions as it embarks on a renewal and restructuring programme and hence there have been 4 additions in other universities.

Consistent with this there are now, 7 geoscience schools (8 in 2010) with more than 12 teaching positions, 7 (5 in 2010) with 8-12 teaching positions and 5 (4 in 2010) with less than 8 teaching positions. The research positions are unevenly distributed with 64 at ANU, 29 at Curtin, 25 at Melbourne and UTAS, 19 at UWA, 5-15 at Adelaide, Macquarie, Monash, UNSW, Queensland, Sydney and Wollongong and less than 5 at Ballarat, JCU, QUT and none at UNE.

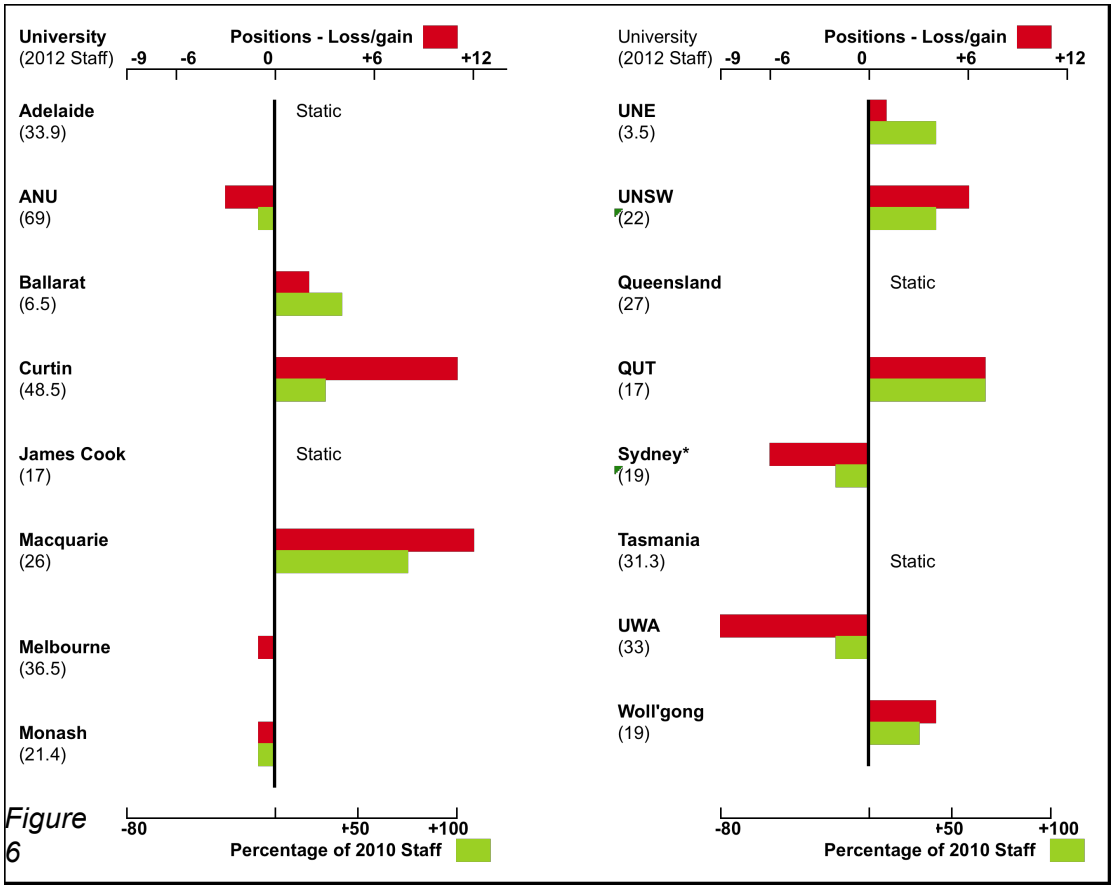


Figure 6

Geoscience staffing at Australian universities showing changes from 2010 to 2012

The combination of teaching and research positions results is a wide range in capability between the 'geoscience' universities (Figure 6) with ANU and Curtin having in excess of 40 geoscience staff; Adelaide, Melbourne, UTAS, and UWA having between 30 and 40; Macquarie, Monash, UNSW, Queensland and Sydney

having 20 to 30; James Cook, Newcastle, Sydney having 10-20 and Ballarat, Canberra and UNE having less than 10 staff. The high number (69) of positions at the ANU reflects the unique nature of the Research School of Earth Sciences.

The growth or loss in geoscience positions at the various institutions is shown in Figure 6. Institutions showing the greatest growth in both geoscience teaching and research personnel since the 2007 survey have been Curtin and Macquarie - 10 to 12 positions. UNSW, QUT and Wollongong have gained between 4 and 7 positions whilst Adelaide, JCU, Melbourne, Monash, Queensland, and UTAS have been more or less static and Sydney and UWA have lost positions. Small increases off a low base have been reported for Ballarat and UNE. The loss of teaching positions at UTAS has been offset by growth in research positions, albeit these are short term.

Nationally, the total EFTSL per teaching academic is 16.2 up from 9.6 in 2010. Compared with 2010 all universities have higher EFTSL per teaching academic. There is now only 1 institution below 10 (4 in 2010), 6 between 10 and 15 (6 in 2010) and 11 above 15 (6 in 2010) (Table 7); there are 5 with values above 20.

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 2010 survey has shown a turn around in undergraduate enrolment in geoscience. The commencement of the turn-around was evident at Levels 2 and 3 in the 2007 survey, but it was unclear as to whether this would be sustained. The 2010 survey clearly showed that this recovery was sustained, had strengthened and the enrolment in the Honours year had substantially reversed the decline seen in the decade up to 2007.

The 2012 survey has shown that total enrolments and at each of Levels 1-3 have continued to grow since 2010, but enrolments in the Honours year have declined slightly since 2010. Whilst the transition to a Masters Program, which substitutes for Honours at Melbourne and Macquarie could account for the decline in Honours enrolments at these schools.

There is no doubt that the continuing resources boom has been the main driver in attracting students into geoscience. A contributing factor has also been the revision of the school curriculum in WA, a further two years of effort by resource industry bodies, and 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 in total but there is much variation from university to university (Figure 3). 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. However UNSW has commented that in their experience, there is zero correlation between 'outreach' and student enrolment in geoscience at Level 1. A further complicating factor is that several universities now require students to take 'breadth courses' unrelated to their major and this may also account for some higher enrolments in geoscience.

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, but the level of interest appears to be reaching a plateau, despite the extensive program of activities aimed at stimulating interest in the geosciences (e.g. WA High School Curriculum, Earth Science Western Australia). At Adelaide, 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, which in 2010 was flagged for introduction in 2014 has now been delayed and may not have the impact that was previously envisaged as the 'national curriculum' concept is adapted to State priorities. There is also uncertainty here with the incoming Coalition Government.

This survey has recorded the Bachelor degrees awarded since 2007. As expected the degrees awarded follow the enrolment trends (Figure 5) with a continuing increase in the award of BSc (Geoscience Major) degrees and a slight decline in the award of BSc (Honours) degrees. In 2007, it was concluded that in general Honours degrees were not attractive to students completing their basic degrees, but this situation had completely turned around by 2010 and may have reflected a maturing of the recruitment market where more highly trained students are valued. It is instructive that the number of Masters Degrees by coursework and dissertation, which had grown dramatically in 2010, has once again increased substantially (Figure 5 and Table 7). This reflects universities responding to the need for a broader skills base, specialist training for professional life in industry, as well as an increasing recognition that such a course is perhaps a better preparation for a research degree than an Honours course (e.g. Melbourne).

Several universities have continued to review their course structures including the introduction of MSc degrees. This is in part due to increased enrolments and the need to streamline courses to manage teaching pressures and render courses economic, but also because there is much greater awareness of the skills required of graduates in the workforce. Sharing between institutions of specialist teaching particularly at the Honours and Masters levels is continuing. Geophysics has been a particular focus although whether the concerns of the Mineral Council Survey of geophysics teaching in 2008[5] have been addressed is beyond the scope of this study.

Once again the impression given from this survey is that schools are generally more conscious of the skills requirements required 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. However, with the mineral industry employment downturn now occurring, it is a matter of concern as to whether the current crop of graduates can be absorbed by industry and indeed there is some anecdotal evidence that the market is becoming tighter for graduates.

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 per teaching academic 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.

From 2007, there has been a systematic increase in the EFTSL per teaching staff member with now six universities above 20, five between 15 and 20 and only 1 below 10. This indicates improving financial viability for many schools and EFTSL per teaching academic is becoming a key indicator for some universities. This factor may partly explain the changes underway in UTAS outlined above where the EFTSL/Teaching Academic was 6.5 in 2010 and, with reduced staff numbers in 2012, is now 17.2.

The growth in MSc degrees 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 2010, 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 grow this has become an increasing issue and it is difficult to achieve the economies of scale to make teaching 'economic'. The approach by the ANU in this regard is of interest. They are using a relatively small number of academic staff for teaching but supplementing this by a large number of 'demonstrators' derived from their large body of PhD students. This is the traditional way of supplementing teaching, but is not available to many universities where the number of PhD students is low compared with ANU.

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. Apart from UTAS where teaching positions have reduced markedly, there has been a slight increase in the numbers of academic staff engaged in teaching as the student numbers have increased.

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.

Whilst Federal Government initiatives in Tertiary Education in 2009-2010 were positive in this regard the higher education reductions in the 2013 budget have provided additional pressures the full impact of which remain to be seen.

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. The outcome of the 'renewal and restructuring' programme at UTAS will be of interest in this regard.

In this regard, the lack of sustained growth in output of PhD degrees to match the overall strengthening of schools is a concern. Although the 2012 output was the highest since 2004, it was preceded by a very low year. On average the output of PhD graduates for the period 2009-2012 has been lower by 7% than the period 2003-2006 with the intervening years being lower by 16%. This both affects the financial viability of schools and 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, the supply of early career researchers is tight 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 and training. 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 the financial position of many schools has improved as student numbers have increased whilst some of the larger schools are thriving in comparison with many of the smaller schools. However the emerging threat is the impact of the minerals industry downturn on the attractiveness of geoscience to students. There is a real concern that we are about to repeat the boom – bust cycle of the past.

Figure 7 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*	ANU	Ball	Canb	Curtin**	JCU	M'qua	Melb	Monash	UNE	UNSW	Q'SL	QUT	UTAS	UWA	Woll
TEACHING & RESEARCH STAFF																
>40		69			50											
30 to 39	33													31.3	33	
20 to 29							23	20	21.4		22	27.2				
10 to 19						17							17			19
<10			5.5	3						3.5						
TEACHING STAFF																
>20					21											
15-20	18														18	
12 to 15											14	14.2				
8 to 11						13	10	9.75	11.7				11			10
<8		5	5	3						3.5				4.7		
EFTSL																
>325	533															
250-325					299											
175-250							227		238		209	228				
100-175						159		115							161	181
<100		81	78	65						77			93	81		
EFTSL PER TEACHING STAFF																
>20	29.6			21.7			22.7		20.3	22						
15 to 19.9		16.2										16.1		17.3		15.9
10 to 14.9			14.2		14.2	12.2		11.8			14.9				11.5	
<10													8.5			
Degree Profile																
BSc Geoscience Major	76	4	14	6	94	24	22	32	115	n/a	18	52	22	53	55	36
Bsc Honours	43	18	3	2	15	10	10	9	27	n/a	16	8	3	19	22	10
MSc/ MPhil Research									1		2		2	1	2	
MSc Coursework + Dissertation	7	2			16	11	17	13				5		4	17	6
PhD	5	16		1	6	3	3	6	5		6	11	2	6	6	7
COURSE OPTIONS LEVEL 3																
Predominantly Solid Earth Science																
Extensive Environment Component																

* Includes ASP with Higher Degree Estimate; ** Includes Geophysics; n/a not available

Figure 7: Profile of overall strength of Australian Universities in geoscience in 2012 – only respondents to the 2012 survey are included

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 sustaining 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	Degrees
University of Adelaide **School of Earth and Environmental Science**	**BSc /BSc Advanced/BSc (Hons)** - **Geology** - **Geophysics** **BSc(Hons) Minerals Geoscience** Adelaide is a participant in the Minerals Geoscience Honours program (Table 3) Geophysics has been strengthened with emphasis on mathematical content in undergraduate courses and specialist geophysics units. **PhD (No MSc currently)** Adelaide is currently discussing whether to adopt a 3 and 2 model (3 years of undergraduate) and 2 years of Masters for 2014. The Masters program will be course work and research project designed to follow on from the 3 year undergraduate program.
School of Petroleum	**BSc (Hons) Petroleum Geology & Geophysics**
Australian National University **Research School of Earth Sciences**	**BSc** - **Earth Science** - **Marine Science** - **Water Science** **BSc (Hons) - Geology** **BSC (Hons) – Geophysics** ANU is part of the Minerals Geoscience Honours program (Table 3). Increased quantitative emphasis **M.Phil by research, PhD** **MSc by coursework** - **Natural Hazards** Masters programs are under review
University of Ballarat **School of Science, Information Technology and Engineering**	**BAppSci/Hons – Geology** Geoscience is also offered as part of BSc, BSc (Environmental Management) B.EngSci. Participates in VIEPS. Course review in 2012 strengthened minerals science and engineering geology became core subject. **MSc App Sci (research), PhD**
University of Canberra Faculty of Education, Science Technology and Mathematics.	**BSc/Hons - Earth Science** Major focuses on landscape, soils, regolith and geochemistry; courses contribute to other majors. **M.Phil by research, PhD**

Table 1 Continued

Institution - School	Degrees
Curtin University of Technology (Western Australian School of Mines - WASM). **Department of Applied Geology**	***BSc/ BSc (Hons)* - Applied Geology** Three streams are offered in final year: *Mineral Exploration & Mining Geology* offered at Kalgoorlie and *Applied Geology* and *Petroleum Geoscience*. BSc *Applied Geology* also offered at Miri Sarawak Malaysia Campus with the Petroleum Geology stream in the final year. Curtin is a participant in the Minerals Geoscience Honours program (Table 3) **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 Mineral Geoscience Masters program is offered jointly by JCU, Curtin, UTas and UWA see Table 3
Department of Exploration Geophysics	***BSc/ BSc (Hons) - Geophysics*** Geophysics Major is also offered at the Sarawak Campus, Malaysia ***MSc (Geophysics – coursework)*** ***MPhil (Geophysics); PhD*** MSc by coursework has been increased from 1 to 2 years
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
James Cook University **School of Earth and Environmental Sciences**	**BSc/BSc(Hons)** - **Geology** - **Environmental & Marine Geoscience (2012)** **BGeology/BGeology(Hons)** Participates in Minerals Geoscience Honours program (Table 3) **MSc (Research), PhD** **MSc - Environmental Earth Sciences (coursework)** **Minerals Geoscience Masters** Latter is offered jointly by JCU, Curtin, UTas and UWA (Table 3)

Table 1 Continued

Institution - School	Degrees
Latrobe University **School of Life Sciences**	**BSc /BSc (Hons)** - **Environmental Science – Hydrogeology** Note: Geoscience is offered in general BSc. BSc Environmental Science to be discontinued. Part of VIEPS. **MSc (Research), PhD**
Macquarie University **Department of Earth and Planetary Sciences**	**BSc** - **Geology** - **Geophysics** - **Environmental Geology** Courses contribute to Bachelor Marine Science Honours has been discontinued (see Masters), Field mapping course share with Sydney University and Honours courses through SUCOGG **Masters of Research, PhD** **MSc (Geoscience specialization)** Master of Geoscience by course work has been discontinued and replaced with a Masters of Research (2 years) in place of Honours MSc (Geoscience Specialization) has been retained to target those already working who need to upgrade their skills.
Monash University **School of Geoscience**	BSc/BSc (Hons) – Geoscience, BEnvSc 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) and VIEPS. **MSc (Research), PhD**
University of Melbourne **School of Earth Sciences**	**BSc/BSc (Hons)** - **Geology** - **Atmosphere and Ocean Science** Geoscience also taken by other BSc students without completing a major. Introductory course available as breadth subject to students in other courses (e.g., BA, BComm, B Enviro)). Melbourne participates in the Minerals Geoscience Honours program (Table 3) and VIEPS. New courses in geophysics, basin analysis, petroleum geology biogeochemistry and paleontology have been introduced to fill perceived gaps **MPhil (Research) PhD** **MSc (coursework)** The Master of Science is offered as a 2-year program of study including 3/4 year of discipline specific coursework as well as a small number of professional tools electives such as science communication, e-science etc) and 1.25 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.

Table 1 Continued

Institution - School	Degrees
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** 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. **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**
University of New South Wales **School of Biological; Earth & Environmental Sciences**	**BSc/BSc (Hons); BAdvSc(Hons); BEnvSci** - **Geology** - **Geoscience** - **Geochemistry** - **Earth Sciences** Increase in hydrogeology courses and hardrock/minerals; decrease focus on energy areas. **MPhil (research and coursework); PhD**
University of Queensland **School of Earth Sciences**	**BSc - Geological sciences** **BSc (Hons)** - **Geology** - **Exploration Geophysics** In 2012, introduced Quantitative Geology at second level and in 2013 formed a collaboration with industry to deliver Geostatistics at Level 3. Geomicrobiology introduced at Level 3. More coursework is being considered for Honours. **MPhil(Research); MSc Mineral Resources (Exploration) (coursework and research); PhD**
Queensland University of Technology **School of Earth, Environmental and Biological Sciences**	**BSc/BSc (Hons)** - **Earth Science** - **Environmental Science** New degree structure being introduced with a BSc Major in Earth Science, a minor in Geology with hardrock minerals focus. Environmental Science is a second Major or Minor with a Spatial Science Minor. Courses strengthened in sedimentology, structural geology, geomechanics, geophysics. petroleum geology and marine geoscience. BSc Hons Earth Science is also being revised with higher course content. Increased focus on course efficiency. **M AppSc**; **PhD** Note**:** MAppSc is nder revision to form a new MSc Research with better pathway to PhD studies.

Table 1 Continued

Institution - School	Degrees
RMIT University **School of Applied Sciences**	**BApp Sci (Hons) - Physics (Geophysics)** Note: Retraining physicists as geophysicists for technological rather than geological expertise **MSc, PhD** Need physics or engineering prior degree and study geophysics. Colorado School of Mines: Geophysics exchange program
University of Sydney **School of Geosciences**	**BSc/BSc (Hons)** - **Geology and Geophysics** - **Marine Science** USyd requires 100 hours of course work in addition to thesis at Honours. Participates in SUCOGG. **MSc (research), PhD**
University of Tasmania **School of Earth Sciences**	**BSc** **BSc(Hons)** - **Geology** - **Geophysics** Note: Computational geoscience has been introduced as a 2nd year subject in recognition of skills needs in this area. Due to staffing reductions and school merger substantial changes will occur in 2014 and result in reduction of units to be offered. Participates in the Minerals Geoscience Honours program 2013 (Table 3) **MSc (research)** **Masters (coursework plus dissertation)** - **Economic Geology** - **Exploration geoscience** Mineral Masters program is offered jointly by JCU, Curtin, UTas and UWA see Table 3. Geometallurgy course introduced in Economic Geology in response to industry demand. **PhD**

Table 1 Continued

Institution - School	Degrees
University of Western Australia **School of Earth and Environment**	**BSc/BSc(Hons)** - **Geology** Note undergraduate courses were streamlined in 2012 with enhanced graduate and postgraduate courses at Honours and Masters in line with resource strengths in minerals, petroleum and groundwater. A number of numerical geophysicists now on staff and this area of geophysics is \ therefore expanding. UWA participates in the Minerals Geoscience Honours program (Table 3) **Master of Science (**by thesis and coursework with specialisations in geoscience, mineral geoscience, petroleum geoscience etc. **Master of Hydrogeology** (coursework with 25% research project) **Master of Geoscience** (coursework with 25% research project) **Master of Ore Deposit Geology** (coursework) **Master of Science** (by research+ full thesis, 2 year degree) **PhD** UWA is focused on strengthening postgraduate coursework degrees particularly for international students and in Geoscience. Will continue to develop named postgraduate coursework and coursework + thesis/dissertation degrees and constituent coursework units. Mineral Masters program is offered by JCU, Curtin, UTAS and UWA see Table 3
University of Wollongong **School of Earth and Environmental Sciences**	**BSc/BSc (Hons)** - **Geology** Courses also contribute to International Bachelor of Science; Bachelor of Science (Geosciences; Physical Geography; Environment); Bachelor of Environmental Science. Course revisions undertaken in petrology & quantitative aspects. **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

University of Adelaide - School of Earth and Environmental Science

Level 1	Earth Systems I; Earth's Interior I
Level 2	Sedimentary Sedimentary Geology II; Structural Geology II; Igneous and Metamorphic Geology II; Landscapes Processes and Environments II; Economic and Mine Geology II; Introduction to Environmental Impact Assessment
Level 3	***Geology Major*** - Field Geoscience III; Igneous & Metamorphic Geology III; Tectonics III; Basins Sediments and Regolith **Geophysics & Applied Geology Major** – Exploration Methods III; Geophysics III; Remote Sensing III; Mineral and Energy Resources III; GIS for Environmental Management III ***BSc Mineral Geoscience*** - Tectonics III; Igneous & Metamorphic Geology III; Geophysics III; Exploration Methods III Field Geoscience III; Mineral and Energy Resources III.

Australian National University - Research School of Earth Sciences

Level 1	The Blue Planet - An Introduction to Earth Systems Science: Earth – The Chemistry and Physics of our Planet.
Level 2	Introduction to Structural and Field Geology; Sedimentology and Stratigraphy; Chemistry of Planet Earth; Rocks and Minerals; Geobioloby and Evolution of Life on Earth; Fundamentals of Climate System Science.
Level 3	Field Geology; Structural Geology and Tectonics; Economic Geology; Coral Reef Field Studies; Planetary Science; Magmatism & Metamorphism; Groundwater; Palaeoclimatology and Climate Change; Coastal Environmental Earth Science

University of Ballarat - School of Science; Information Technology and Engineering

Level 1	Earth Sciences; Earth's Living History; Landscape Evolution; Planet Earth; Mineral Science.
Level 2	Structural Geology; Sedimentology and Stratigraphy; Hydrology; Paleontology; Economic Geology; Fieldwork Principles and Practice; Optical Mineralogy; Advanced Fieldwork
Level 3	Petrology; Applied Geochemistry; Fieldwork; Regolith Science; Applied Geophysics; Tectonics & Petrogenesis; Engineering Geology

University of Canberra - Faculty of Education, Science, Technology and Mathematics

Level 1	Earth Systems Science; Earth Surface Processes
Level 2	Australian Landscapes; Regolith and Soils; Geographic Information Systems
Level 3	Applied Geochemistry

Table 2 continued

Curtin University – Department of Applied Geology

Level 1	Evolving Earth Systems & Paleontology; Geology 101, 102; Geoscience, Environment & Society; Geoscience Communication; Mining & Metallurgy
Level 2	Mineralogy & Geochemistry; Sedimentology & Stratigraphy; Structural Geology; Field Geology Techniques; Igneous Petrology, Metamorphic Petrology; Geological Field Mapping
Level 3	**Mining Geology Stream (Kalgoorlie Campus):** Mining Systems; Resource Estimation; Field Geology of Precambrian Terranes; Ore Deposits*; Tectonics & Dynamic Earth*; Mine Planning; Regolith Geology & Mineral Exploration*; Geology Mapping Project* **Petroleum Geology Stream:** Basin Analysis & Energy Resources*; Reservoir Engineering fundamentals; Petroleum Geophysics; Field Mapping of Sedimentary Basins*; Tectonics & the Dynamic Earth*; Formation Evaluation; Petroleum Geology Project; Environmental Geoscience* **Applied Geology Stream:** see asterisked courses above plus Hydrogeology & Engineering Geology

Curtin University – Department of Exploration Geophysics

Level 1	Physical Sciences Foundation Course
Level 2	Structure, Mineralogy & Geochemistry; Introduction to Geophysical Oil and Gas Exploration Methods; Propagation of Energy, Sedimentology & Stratigraphy; Advanced Calculus; Igneous & Metamorphic Petrology; Introduction to Geophysical Mineral Exploration Methods; Electromagnetic Fields in the Earth; Linear Algebra; Geological Field Mapping;
Level 3	Gravity & Magnetics for Exploration; Introduction to Seismic; Exploration; Resistivity & Induced Polarisation Methods; Theoretical Geophysics; Electromagnetics & Radiometrics for Exploration; Geophysical Data Processing; Seismic Acquisition for Exploration; Environmental Geophysics; Geophysics Project.

Flinders University of South Australia - School of Environment (Earth Science Major)

Level 1	Earth and Environment Sciences 1; Marine Sciences 1
Level 2	Coasts and Oceans; Global Climate Change; Microclimate and Soil Processes; Surface Water Hydrology; Sedimentary Processes; Environmental Science 2.
Level 3	Geological Processes; Groundwater; Earth Fluid Modeling; Hydrochemistry; Science of Environmental Change; Field Investigations; Environmental Science 3

Table 2 continued

James Cook University - School of Earth and Environmental Sciences

Level 1	Evolution of the Earth; Environmental Processes and Global Change; Modeling Natural Systems
Level 2	Introduction to Sedimentology; Minerals & Magmas; Introductory Structural & Metamorphic Geology; Earth Resources, Exploration and Environment; Introductory Field Geology; Introduction to Geographic Information Systems; Statistics and Data Analysis
Level 3	Igneous Petrology & Processes; Advanced Structural & Metamorphic Geology; Ore Genesis; Geological Mapping; Field Techniques in Geology; Sedimentary Environments & Energy Resources; Earth & Environmental Geochemistry; Australian Landscape Processes & Evolution; Hydrology; Applied Soil Science; From Icehouse to Greenhouse; Minesite Rehabilitation; Field Studies in Tropical Water & Soil Science; Advanced hydrology; Field Studies in Tropical Geography; Advanced Geographic Information Systems;

La Trobe University - School of Life Sciences

Level 1	Processes that Shape the Earth; Earth Structure, Resources and History of Life
Level 2	Introduction to Land & Soil Management; Climate Change & Landscape Evolution; Imaging & Materials Characterisation
Level 3	Groundwater – Sustainability & Contamination; Land & Soil Management; Landscape Management with Remote Sensing & GIS;

Macquarie University - Department of Earth and Planetary Sciences

Level 1	Earth Dynamics; Marine Geoscience; The Planet Earth;
Level 2	Field & Laboratory Studies in Geoscience; Introduction to Field Geology; Introduction to geophysics; Marine Depositional Environments; Geology of Australia – Global Perspectives.
Level 3	Field Geology & Mapping; Structural & Metamorphic Geology; Liquid Fuels & Energy Security; Magmas, Ores & Geochemistry; Volcanic Geology Fieldwork; Environmental Geology; Global Tectonics; Exploration & Environmental Geophysics I & II; Data & Image Processing in Geophysics & Exploration; Global Tectonics;

University of Melbourne - School of Earth Sciences

Level 1	The Global Environment; Understanding Planet Earth
Level 2	Structural & Metamorphic Geology; Earth Composition, Minerals & Magmas; Field Mapping & Sedimentary Geology
Level 3	Tectonics & Geodynamics; Sedimentary Geology; Hydrogeology/Environmental Geochemistry; Geochemistry and Petrogenesis; Applied Geophysics; Economic Geology; Advanced Field Geology; Geobiology & Paleobiology. Science Research Project.

Table 2 continued

Monash University - School of Geosciences

Level 1	Planet Earth & its Environment: The Cosmic Connection; Planet Earth - Dynamic Systems; Environmental Change & Resources
Level 2	The Dynamic Earth I – Building Continents & the Environment; The Dynamic Earth II - Global processes; The Dynamic Biosphere - Changing Fauna & Flora through Geological Time; Field Geology
Level 3	Ore Deposit Geology & Global Metallogeny; Field Geology of New Zealand; Field Mapping; Hydrogeology & Environmental Geoscience; Earth Sciences Project; Deformation & Metamorphism of the Crust; The Dynamic Biosphere – Changing Fauna & Flora through Geological Time; Geophysics – Regional Mapping; Global Dynamics & Crustal Evolution; Geophysics – Special topics; Sediments, Basins & Resources; Volcanology, Igneous Petrology & Geochemistry

University of New England - School of Environmental and Rural Science

Level 1	Geology and the Environment I & II
Level 2	Field Mapping & Sedimentology; Resource Geology & Environmental Issues: Introductory Palaeontology; Soil Science; Available from University of Newcastle on cross-institutional basis - Optical Mineralogy & Igneous Petrology.
Level 3	Geophysics & Applied GIS for Earth Sciences; Environmental Geology; Palaeontology & Stratigraphy; Landscape Processes; Catchment to Coast; Soil Science; Soils, Pollution & the Environment; Environment & Exploration Geochemistry; Ore Deposit Geology; Climate Change & Future planning; Environmental Change in Australia; Natural Hazards. Available from University of Newcastle on cross-institutional basis - Structural & Field Geology; Igneous Petrology & Crustal Evolution; Geology of Fuels; Metamorphic & Field Geology.

University of Newcastle - School of Environmental & Life Sciences

Level 1	Earth's Dynamic Systems; Earth Processes & Products.
Level 2	Optical Mineralogy & Igneous Petrology; Earth Science Field Course; Earth's Sedimentary Rocks & Environments; GIS & Remote Sensing; River Basin Processes; Environmental Concepts; Energy.
Level 3	Environmental Remediation; Climate Change & Resource Management; Igneous Petrology & Crustal Evolution; Basin Analysis; Geology of Coalfields & Fuels; GIS; Field Course In Carbonate Environments; Global CHange; Advanced Field Course in Earth Sciences; Metamorphic & Field Geology.

University of New South Wales - School of Biological, Earth & Environmental Sciences

Level 1	Fundamentals of Geology; Environmental Earth Science; Environmental Systems & Processes.
Level 2	Structural Geology; Igneous & Metamorphic Petrology; Introduction to Geophysics; Field Geology; Paleobiology; Sedimentary Petrology & Stratigraphy; Mineralogy; Quantitative Geology.
Level 3	Ore Deposits & Exploration Geology; Tectonics & Crustal Evolution; Exploration & Mining Geophysics; Advanced Structural Geology; Sedimentary Environments; Marine Geology & Palae -oceanography; Energy Resources; Geochemistry & Geochronology; Geology of Coral Reefs; Hydrogeology; Ore Body Modeling.

Table 2 continued

University of Queensland - School of Earth Sciences

Level 1	Planet Earth: The Big Picture (2 units); Earth Processes & Geological Materials for Engineers.
Level 2	Structural Geology; Igneous & Metamorphic Petrology; Introduction to Geophysics; Field Geology; Paleobiology; Sedimentary Petrology & Stratigraphy; Mineralogy; Quantitative Geology.
Level 3	Ore Deposits & Exploration Geology; Tectonics & Crustal Evolution; Exploration & Mining Geophysics; Advanced Structural Geology; Sedimentary Environments; Marine Geology & Palae-oceanography; Energy Resources; Geochemistry & Geochronology; Geology of Coral Reefs; Hydrogeology; Ore Body Modeling.

Queensland University of Technology - School of Earth, Environmental and Biological Sciences

Level 1	Earth Systems; Evolving Earth
Level 2	Destructive Earth; Molten Earth; Sedimentary Geology & Stratigraphy; Deforming Earth.
Level 3	Marine Geosciences; Groundwater Systems; Research Practice in Earth Sciences; Geodynamic Earth.

University of Sydney - School of Geosciences

Level 1	Earth Environment & Society; Introduction to Geology; Engineering Geology.
Level 2	Natural Hazards – A GIS Approach; Volcanoes, Hot Rocks & Minerals; Oceans Coasts and Climate Change; Environmental & Resource Management; Fossils & Tectonics Fluvial & Groundwater Geomorphology;
Level 3	Field Geology; Earth's Structure and Evolution; Global Energy & Resources; Regional Development and Environment; Environmental & Sedimentary Geology; Geophysical Methods; Coastal Environments & Processes; GIS in Coastal Management.

University of Tasmania - School of Earth Sciences

Level 1	Understanding Earth Systems; Earth Resources Environments & Evolution.
Level 2	Earth's Materials & Interior; Earth's Surface; Marine Geosciences; Introduction to Geophysics & Computer Applications.
Level 3	Petrology; Tectonics & Volcanology; Sedimentary Environments & Resources; Geological Mapping; Computational Geoscience; Economic Geology; Applied Geophysics; Mineral Exploration; Environmental Geology.

Table 2 continued

University of Technology Sydney – Department of the Environment

Levels 2 & 3	Elective for Environment degrees: Geological Processes; GIS & Remote Sensing; Marine Geosciences

University of Western Australia - School of Earth and Environment

Level 1	Introduction to Geology; The Dynamic Planet.
Level 2	Earth Materials; Earth Processes; Field Geology; Environmental Hydrology.
Level 3	Geological Mapping; Geochemistry & Petrology; Structural Geology & Tectonics; Basin Analysis.

University of Wollongong – School of Earth and Environmental Sciences

Level 1	Planet Earth; Earth Environment & Resources; Landscape Change & Climatology; The Human Environment; Problems & Change; Climate Change
Level 2	Earth's Inferno; Introductory Spatial Science; Sediments & Fuels; Field Geology; Soils, Landscapes & Environmental Change; Biogeography & Environmental Change; Environmental Impact of Societies; Other: Geology for Engineers.
Level 3	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 in 2013 at Honours and Masters levels by Minerals Tertiary Education Council

Minerals Geoscience Honours (MGH) Program

Students enrolling in Honours at one of nine Australian Universities – see below - have the opportunity to participate in the Minerals Tertiary Education Council (MTEC) Minerals Geoscience Honours Program (MGH). 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 (Mo.);
Advanced Hydrogeology (Melbourne);
Exploration Field Skills (UTAS);
Ore Textures and Breccias in Mineralised Systems (JCU.);
Applied Structural Geology in Mining and Exploration (UWA);
Regolith Geoscience and Mineral Exploration (ANU
Mineral Exploration Under Cover (Adelaide);
Mining Geology and Resource Evaluation (Curtin)
Australian Coal Basins (Newcastle)

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

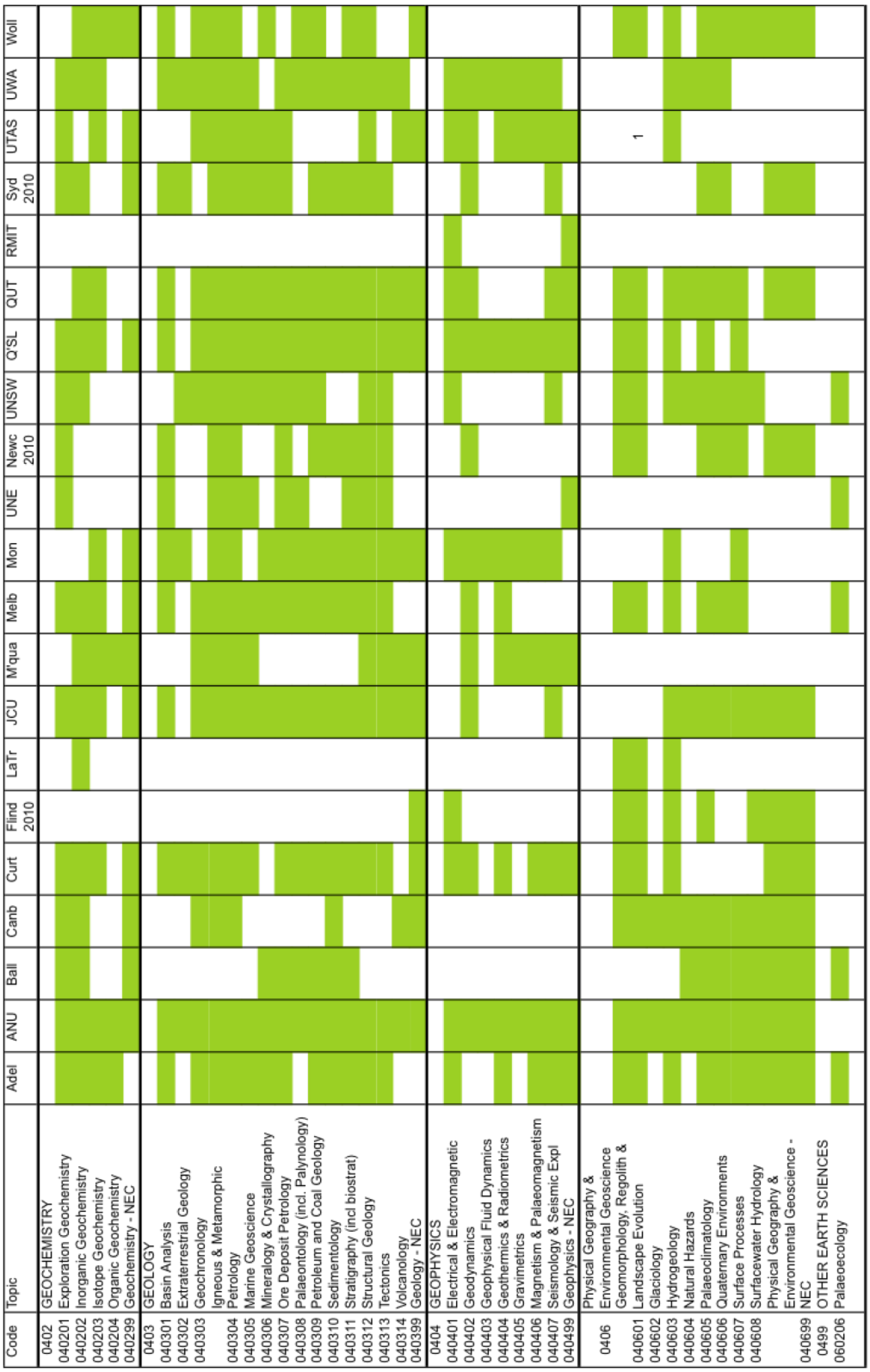
Minerals Geoscience Masters Program

The Minerals Geoscience Masters Program (Ore Deposit Geology and Evaluation) is a coursework Masters program 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 (UWA, UTAS and JCU) 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 UWA and Curtin), the ARC Centre of Excellence in Ore Deposits (CODES, UTAS) the Economic Geology Research Centre (ERGC, JCU) 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 to supervise geoscience theses in 2012 against Australian and New Zeland Research Classification ABS 2008

1. Denotes capability in School of Geography and Environmental Studies



Code	Topic	Adel	ANU	Ball	Canb	Curt	Flind 2010	LaTr	JCU	M'qua	Melb	Mon	UNE	Newc 2010	UNSW	Q'SL	QUT	RMIT	Syd 2010	UTAS	UWA	Woll
0402	GEOCHEMISTRY																					
040201	Exploration Geochemistry																					
040202	Inorganic Geochemistry																					
040203	Isotope Geochemistry																					
040204	Organic Geochemistry																					
040299	Geochemistry - NEC																					
0403	GEOLOGY																					
040301	Basin Analysis																					
040302	Extraterrestrial Geology																					
040303	Geochronology																					
	Igneous & Metamorphic Petrology																					
040304	Marine Geoscience																					
040305	Mineralogy & Crystallography																					
040306	Ore Deposit Petrology																					
040307	Palaeontology (incl. Palynology)																					
040308	Petroleum and Coal Geology																					
040309	Sedimentology																					
040310	Stratigraphy (incl biostrat)																					
040311	Structural Geology																					
040312	Tectonics																					
040313	Volcanology																					
040314	Geology - NEC																					
040399	GEOPHYSICS																					
0404	Electrical & Electromagnetic																					
040401	Geodynamics																					
040402	Geophysical Fluid Dynamics																					
040403	Geothermics & Radiometrics																					
040404	Gravimetrics																					
040405	Magnetism & Palaeomagnetism																					
040406	Seismology & Seismic Expl																					
040407	Geophysics - NEC																					
040499	Physical Geography & Environmental Geoscience Geomorphology, Regolith &																			1		
0406	Landscape Evolution																					
040601	Glaciology																					
040602	Hydrogeology																					
040603	Natural Hazards																					
040604	Palaeoclimatology																					
040605	Quaternary Environments																					
040606	Surface Processes																					
040607	Surfacewater Hydrology																					
040608	Physical Geography & Environmental Geoscience - NEC																					
040699	OTHER EARTH SCIENCES																					
0499	Palaeoecology																					
060206																						

Table 5: Enrollment data for undergraduate geoscience courses at Australian universities

University of Adelaide (includes Australian School of Petroleum - ASP)	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**No of Courses 2012**
Average Number of Students per Course											
Year 1	90	166	192	147	162	148	168	220	260	312	2
Year 2	35	31	52	52	68	106	105	109	115	117	3
Year 3	16	19	34	36	36	51	76	80	78	93	7
Hons	14	8	9	19	23	19	35	37	32	34	
ASP Hons	10	10	6	8	5	4	10	14	15	9	
Y3/Y1 Retention			38%	22%	19%	35%	47%	54%	46%	42%	
Hons/Yr3 Retentior	113%	79%	79%	78%	64%	88%	67%	59%	55%		
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1	34	41	48	55	61	74	84	110	130	156	42%
Year 2	27	23	31	30	40	53	66	109	115	117	7%
Year 3	26	30	38	41	41	57	86	184	181	217	18%
Hons	14	8	9	19	23	19	35	37	32	34	-8%
ASP Hons*	10	10	6	8	5	4	10	14	15	9	-36%
Total	111	112	132	153	170	207	280	454	473	533	17%

Australian National University	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**No of Courses 2012**
Average Number of Students per Course											
Year 1	80	70	50	50	100	77	73	68	128	84	2
Year 2	40	35	30	30	35	26	27	20	25	24	7
Year 3	19	19	15	15	20	16	20	19	16	18	11
Hons	15	15	15	14	7	16	14	16	20	18	
Y3/Y1 Retention			19%	21%	40%	32%	20%	25%	22%	26%	
Hons/Yr3 Retentior	79%	79%	93%	47%	80%	88%	80%	105%	113%		
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1	20	12	12	17	12	19	18	17	16	21	24
Year 2	20	17	15	15	17	23	24	18	22	18	0
Year 3	14	14	11	11	15	24	30	29	23	24	-17
Hons	15	15	15	14	7	16	14	16	20	18	13
Total	69	58	53	57	51	82	86	80	81	81	1

University of Ballarat (only averaged data given to 2007)	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**No of Courses 2012**
Average Number of Students per Course											
Year 1	15	14	23	23	28	54	36	50	65	76	4
Year 2	11	16	13	16	17	28	29	22	26	31	6
Year 3	11	9	11	16	17	12	17	20	16	17	6
Hons	5	5	3	2	2	1	1	2	0.5	5	
Y3/Y1 Retention			73%	114%	74%	52%	61%	37%	44%	34%	
Hons/Yr3 Retentior	45%	33%	18%	13%	6%	8%	12%	3%	31%		
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1	7	7	11	11	14	27	18	25	32	38	52%
Year 2	8	12	10	12	13	25	25	19	23	23	21%
Year 3	8	7	8	10	12	8	12	14	14	12	-14%
Hons	5	5	3	2	2	1	1	2	0.5	5	150%
Total	28	31	32	35	41	61	56	60	70	78	30%

Table 5 continued

University of Canberra	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	No of Courses 2012
Average Number of Students per Course											
Year 1							30	42	75	80	2
Year 2								30	36	40	2
Year 3								10	26	26	1
Hons									2	3	
Y3/Y1 Retention									87%	62%	
Hons/Yr3 Retention									20%	12%	
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1							4	11	18	20	82%
Year 2								8	22	26	225%
Year 3								1.25	16	16	1180%
Hons									2	3	
Total								19	58	65	242%

Curtin University - Applied Gology (data to 2007 includes geophysics)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	No of Courses 2012
Average Number of Students per Course											
Year 1	32	56	52	68	87	143	149	155	118	134	5
Year 2	13	13	21	20	36	57	74	82	96	81	7
Year 3	9	10	11	16	16	30	43	59	61	63	8
Hons	14	5	5	8	2	2	6	13	14	12	6
Y3/Y1 Retention			34%	29%	31%	44%	49%	41%	41%	41%	
Hons/Yr3 Retentior	56%		50%	73%	13%	13%	20%	30%	24%	20%	
Exploration Geophysics											
Year 1						14	18	20	18	17	3
Year 2						30	15	21	44	23	5
Year 3						20	21	16	18	25	10
Hons						10	8	20	12	4	9
Y3/Y1 Retention								114%	100%	125%	
Hons/Yr3 Retention							40%	95%	75%	22%	
Equivalent Full Time Student Load (EFTSL)											**EFTSL* Increase 0ver 2010**
Year 1	34	63	58	78	102	112	126	141	74	84	-40
Year 2	28	29	46	45	67	44	63	74	84	71	-4
Year 3	30	33	40	60	57	23	36	53	61	63	19
Hons	25	12	9	19	8	2	5	12	14	12	0
Total	117	137	153	202	234	181	230	280	233	230	-18
Exploration Geophysics											
Equivalent Full Time Student Load (EFTSL)											
Year 1	* Overall includes both geology					14	18	20	18	17	-15
Year 2	and geophysics					30	15	21	44	23	10
Year 3						20	21	16	18	25	56
Hons						10	8	20	12	4	-80
Total						74	62	77	92	69	-10

Table 5 continued

Flinders University	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**No of Courses 2012**
	Average Number of Students per Course										
Year 1											2
Year 2											3
Year 3											4
Hons											7
Y3/Y1 Retention											
Hons/Yr3 Retention											
	Equivalent Full Time Student Load (EFTSL)										**EFTSL Increase 0ver 2010**
Year 1						36	42	46	*46*	*46*	
Year 2	No data for 2011 & 2012					27	19	27	*27*	*27*	
Year 3	so 2010 data used					14	25	14	*14*	*14*	
Hons						5	18	12	*12*	*12*	
Total						82	104	99	*99*	*99*	

James Cook University	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**No of Courses 2012**
	Average Number of Students per Course										
Year 1	90	72	90	102	109	171	150	243	196	235	2
Year 2	15	24	24	27	23	24	33	48	43	51	7
Year 3	15	12	14	11	13	13	16	18	24	25	11
Hons	13	9	10	5	2	4	9	9	2	14	
Y3/Y1 Retention			16%	15%	14%	13%	15%	11%	16%	10%	
Hons/Yr3 Retentior	60%		83%	36%	18%	31%	69%	56%	11%	58%	
	Equivalent Full Time Student Load (EFTSL)										**EFTSL Increase 0ver 2010**
Year 1	33	27	34	38	39	86	75	122	49	59	-52%
Year 2	17	24	24	27	23	18	25	36	43	51	42%
Year 3	22	16	18	14	17	10	12	14	30	35	150%
Hons	13	13	9	10	5	4	9	9	2	14	56%
Total	85	80	85	89	84	118	121	181	124	159	-12%

La Trobe University	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**No of Courses 2012**
	Average Number of Students per Course										
Year 1						82	95	97	80	60	1
Year 2									60	60	1
Year 3				Years 2 and 3		29	26	32	13	8	1
Hons						4.5	1.5	3.5	3	2	
Y3/Y1 Retention										8%	
Hons/Yr3 Retention										15%	
	Equivalent Full Time Student Load (EFTSL)										**EFTSL Increase 0ver 2010**
Year 1						21	24	24	20	15	-38%
Year 2									15	15	
Year 3						8	8	9	4	2	-78%
Hons						5	2	4	3	2	-43%
Total						34	34	37	42	34	-8%

Table 5 continued

Macquarie University	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**No of Courses 2012**
					Average Number of Students per Course						
Year 1	123	114	110	115	135	166	146	186	195	274	3
Year 2	37	28	28	29	28	35	46	68	79	88	7
Year 3	14	22	16	18	17	22	26	25	24	37	8
Hons	6	1	11	5	***5***	6	5	15	5	10	
Y3/Y1 Retention			13%	16%	15%	19%	19%	15%	16%	20%	
Hons/Yr3 Retentior		7%	50%	31%	28%	35%	23%	58%	20%	42%	
					Equivalent Full Time Student Load (EFTSL)						**EFTSL Increase 0ver 2010**
Year 1	49	45	43	46	54	58	37	47	73	103	119%
Year 2	39	26	26	28	27	16	22	32	69	77	141%
Year 3	20	30	21	25	20	15	17	17	24	37	118%
Hons	6	1	11	5	***5***	6	5	15	5	10	-33%
Total	114	102	101	104	106	95	81	111	171	227	105%

Melbourne University	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**No of Courses 2012**
					Average Number of Students per Course						
Year 1	146	127	121	133	140	153	158	147	127	102	2
Year 2	32	51	52	43	48	59	55	74	72	92	5
Year 3	28	28	29	32	33	32	32	30	28	27	7
Hons	24	22	25	25	18	28	19	16	11	9	
Y3/Y1 Retention			20%	25%	27%	24%	23%	20%	18%	18%	
Hons/Yr3 Retentior		79%	89%	86%	56%	85%	59%	50%	37%	32%	
					Equivalent Full Time Student Load (EFTSL)						**EFTSL Increase 0ver 2010**
Year 1	36	32	30	33	35	38	40	37	32	26	-30%
Year 2	20	32	32	26	30	37	34	46	45	57	24%
Year 3	25	25	29	33	29	28	28	26	24	23	-12%
Hons	24	22	25	25	18	28	19	16	11	9	-44%
Total	105	111	116	117	112	131	121	125	112	115	-8%

Monash University	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**No of Courses 2012**
					Average Number of Students per Course						
Year 1	187	216	193	192	192	201	196	310	207	222	3
Year 2	33	44	38	56	72	70	72	62	100	101	4
Year 3	16	18	21	17	30	27	33	30	35	56	13
Hons	6	7	14	16	***13***	29	22	24	32	27	2
Y3/Y1 Retention			11%	8%	16%	14%	17%	15%	18%	18%	
Hons/Yr3 Retentior		44%	78%	76%	76%	97%	81%	73%	107%	77%	
					Equivalent Full Time Student Load (EFTSL)						**EFTSL Increase 0ver 2010**
Year 1	47	54	49	48	48	50	49	77	77	84	9%
Year 2	21	22	19	28	36	35	36	31	50	50	61%
Year 3	24	28	31	28	49	44	54	49	48	77	57%
Hons	4	4	11	13	***13***	29	22	24	32	27	13%
Total	96	108	110	117	146	158	161	181	207	238	31%

Table 5 continued

University of New England	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	No of Courses 2012
Average Number of Students per Course											
Year 1									127	169	2
Year 2									34	39	3
Year 3		Only EFTSL data available							35	29	4
Hons									2	3	
Y3/Y1 Retention											
Hons/Yr3 Retention										9%	
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1	20	20	18	15	16	20	36	26	32	44	69%
Year 2	7	8	12	12	7	15	19	22	13	15	-32%
Year 3	3	3	5	7	8	5	5	4	17	15	275%
Hons	3	3	2	2	2	2	1	1	2	3	200%
Total	33	34	37	36	33	42	61	53	64	77	45%

University of Newcastle (no data for 2011-12)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	No of Courses 2012
Average Number of Students per Course											
Year 1	132	100	87	101	105						2
Year 2	31	31	36	41	41	Only EFTSL data available					7
Year 3	20	22	25	24	34						6
Hons	4	5	5	2	6						
Y3/Y1 Retention			19%	24%	39%						
Hons/Yr3 Retentior	25%	23%	8%	25%							
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1	66	50	44	50	52	37	47	44	*44*	*44*	
Year 2	47	47	54	62	71	48	55	73	*73*	*73*	
Year 3	56	56	64	49	51	27	35	35	*35*	*35*	
Hons	4	5	5	2	6	2	2	3	*3*	*3*	
Total	173	158	167	163	180	114	139	155	*155*	*155*	

University of New South Wales	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	No of Courses 2012
Average Number of Students per Course											
Year 1	87	96	112	122	165	166	175	172	194	195	3
Year 2	23	19	16	19	20	35	31	37	32	41	8
Year 3	25	20	25	25	23	31	34	29	39	38	16
Hons	5	6	5	3	5	9	13	16	16	18	
Y3/Y1 Retention			29%	26%	21%	25%	21%	17%	22%	22%	
Hons/Yr3 Retentior	24%	25%	12%	20%	39%	42%	47%	55%	46%		
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1	33	36	42	46	62	63	66	68	73	73	7%
Year 2	15	14	12	14	15	39	36	42	32	41	-2%
Year 3	22	20	28	27	22	42	46	44	67	77	75%
Hons	5	6	5	3	3	9	12	18	16	18	0%
Total	75	76	87	90	102	153	160	172	188	209	22%

Table 5 continued

University of Queensland	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**No of Courses 2012**
Average Number of Students per Course											
Year 1	160	170	170	200	210	241	304	317	375	438	2
Year 2	21	19	18	26	33	34	41	30	52	58	6
Year 3	18	13	14	7	20	18	25	30	27	37	8
Hons	13	11	9	11	5	2	4	11	17	21	
Y3/Y1 Retention			9%	4%	12%	9%	12%	12%	9%	12%	
Hons/Yr3 Retentior	61%	69%	79%	71%	10%	22%	44%	57%	78%		
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1	40	42	42	50	52	60	76	79	94	110	39%
Year 2	13	12	11	16	21	25	31	22	39	51	132%
Year 3	16	11	12	6	17	15	29	30	33	46	53%
Hons	13	11	9	11	5	2	4	11	17	21	91%
Total	82	76	74	83	95	102	140	142	183	228	61%

Queensland University of Technology	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**No of Courses 2012**
Average Number of Students per Course											
Year 1	86	80	70	61	85				55	103	
Year 2	21	24	25	32	41				31	49	
Year 3	15	15	19	12	20				15	25	
Hons	5	2	5	3	2				3	3	
Y3/Y1 Retention			22%	15%	29%						
Hons/Yr3 Retentior	13%	33%	16%	17%						20%	
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
						Data reproduced from 2007					
Year 1	21	20	17	15	21	*21*	*21*	*21*	*14*	*52*	148%
Year 2	15	18	22	28	36	*36*	*36*	*36*	*16*	*25*	-31%
Year 3	15	15	19	12	20	*20*	*20*	*20*	*8*	*13*	-35%
Hons	5	2	5	3	2	*2*	*2*	*2*	*3*	*3*	50%
Total	56	55	63	58	79	*79*	*79*	*79*	*41*	*93*	18%

RMIT University	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	
Average Number of Students per Course											
Hons						1	3	3	3	1	
Equivalent Full Time Student Load (EFTSL)											
Hons						1	3	3	3	1	

Sydney University (no data for 2011-12)	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**No of Courses 2012**
Average Number of Students per Course											
Year 1	116	92	100	100	150	188	272	269			2
Year 2	25	33	40	39	47	41	51	55			3
Year 3			19	22	21	25	34	29			6
Hons	5	8	5	11	9	9	11	9			2
Y3/Y1 Retention			16%	24%	21%	25%	23%	15%			
Hons/Yr3 Retention				58%	41%	43%	44%	26%			
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1	87	69	75	76	76	68	90	91	*91*	*91*	
Year 2	19	33	40	39	35	16	21	18	*18*	*18*	
Year 3	***16***	***24***	24	27	26	14	19	19	*19*	*19*	
Hons	5	8	5	11	9	9	11	9	*9*	*9*	
Total	127	134	144	153	146	107	141	137	*137*	*137*	

Table 5 continued

University of Tasmania	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	No of Courses 2012
Average Number of Students per Course											
Year 1	81	127	90	105	95	89	91	98	81	109	2
Year 2	25	29	46	43	32	34	34	43	31	29	4
Year 3	15	16	16	30	18	14	13	19	21	17	10
Hons	20	14	9	8	13	7	13	15	11	19	
Y3/Y1 Retention			20%	24%	20%	13%	14%	21%	23%	17%	
Hons/Yr3 Retentior	93%	56%	50%	43%	39%	93%	115%	58%	90%		
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1	20	32	22	26	24	22	23	25	20	27	8%
Year 2	9	11	17	16	12	17	17	22	15	14	-36%
Year 3	9	10	10	19	11	16	15	21	24	21	0%
Hons	20	14	9	8	13	7	13	15	11	19	27%
Total	58	67	58	69	60	62	68	83	70	81	-2%

University of Technology Sydney (Earth & Environment degree closed 2003)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	No of Courses 2012
Average Number of Students per Course											
Year 1	55	52	91	71	93						
Year 2	10	4	0	58	60						
Year 3	12	12	8	0	20						
Hons	0	2	2	1	2						
Y3/Y1 Retention											
Hons/Yr3 Retention											
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1	7	6	11	9	12						
Year 2	6	1	0	7	8						
Year 3	6	6	1	0	3						
Hons	2	1	2	2	0						
Total	21	14	14	18	23						

University of Western Australia	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	No of Courses 2012
Average Number of Students per Course											
Year 1		70	90	139	169	186	211	209	264	316	2
Year 2		17	18	29	54	52	51	53	71	89	5
Year 3		7	14	11	20	29	33	30	40	56	7
Hons		10	4	11	12	10	10	19	19	21	
Y3/Y1 Retention				16%	22%	21%	20%	16%	19%	27%	
Hons/Yr3 Retention			57%	79%	109%	50%	34%	58%	63%	53%	
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1	17	17	22	35	42	47	53	52	66	79	52%
Year 2	9	9	9	15	27	33	32	33	27	33	0%
Year 3	5	5	15	12	23	30	34	32	20	28	-13%
Hons	9	10	4	11	12	10	10	19	19	21	11%
Total	40	41	50	73	104	120	129	136	132	161	18%

Table 5 continued

University of Wollongong	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	No of Courses 2012
Average Number of Students per Course											
Year 1		123	153	108	171			100		152	3
Year 2		57	53	69	73			65		60	4
Year 3		43	27	31	40			55		40	4
Hons	3	4	4	3	4	18	13	14		10	
Y3/Y1 Retention				25%	26%					40%	
Hons/Yr3 Retention			9%	11%	13%						
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
									No data 2011		
Year 1	60	61	76	54	86	50	50	50	50	57	14%
Year 2	68	71	66	69	73	65	65	65	65	52	-20%
Year 3	40	43	36	41	54	34	42	44	44	40	-9%
Hons	3	4	4	3	4	18	13	14	14	10	-29%
Total	171	179	182	167	217	167	170	173	173	159	-8%

National Total	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	
Average Number of Students per Course											
Year 1	1480	1745	1794	1837	2196	2079	2272	2703	2565	3078	
Year 2	372	475	510	629	728	631	664	819	947	1073	
Year 3	233	267	318	323	398	369	449	531	516	637	
Hons	152	144	146	155	135	180	198	257	220	243	
Y3/Y1 Retention			21%	19%	22%	20%	20%	26%	23%	24%	
Hons/Yr3 Retentior	62%	55%	49%	42%	45%	54%	57%	41%	47%		
Equivalent Full Time Student Load (EFTSL)											**EFTSL Increase 0ver 2010**
Year 1	631	634	654	702	808	923	997	1133	1069	1246	10%
Year 2	388	409	446	489	558	602	641	754	857	877	16%
Year 3	357	376	410	422	475	454	574	676	724	839	24%
Hons	185	154	148	171	142	191	219	276	258	267	-3%
Total	1561	1573	1658	1784	1983	2170	2430	2838	2908	3229	14%

Table 6: Geoscience degrees awarded at Australian Universities – Data on BSc degrees collected only from 2007. Values in small font and italics indicated no source data and values are calculated or extrapolated by the author.

University / Degree	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
University of Adelaide (* includes Australian School of Petroleum)										
BSc Geoscience Major					29	49	62	76	69	76
BSC Hons*					29	24	42	50	47	43
MSc/MPhilRes			1	1	1	3	0	0	0	0
MSc coursework*						5	8	6	*7*	*7*
PhD*	3	4	3	4	5	6	6	3	*5*	*5*
Australian National University										
BSc Geoscience Major					7	4	7	4	4	4
BSC Hons					8	18	14	18	20	18
MSc/MPhilRes	2	3	3	4	4	1	1	1	0	0
MSc coursework	3	2	1	3	2	4		4	2	2
PhD	13	7	9	12	13	6	10	12	8	16
University of Ballarat										
BSc Geoscience Major					13	6	6	15	12	14
BSC Hons					1	3	0	0	0	3
MSc/MPhilRes	1									
MSc coursework										
PhD				1	1	1				
University of Canberra										
BSc Geoscience Major	full geology course not completed until 2012									6
BSC Hons										2
MSc/MPhilRes										
MSc coursework								1	1	0
PhD	2	2	1	1	1	0	1	2	0	1
Curtin University Applied Geology (includes Geophysics 2003-2007)										
BSc Geoscience Major						15	28	51	60	76
BSC Hons						2	2	7	12	11
Grad Diplomas	1	2	1	0	0	0	0	2	no data	
Postgraduate Diplomas	1	3	1	6	1	9	4	12		
MSc/MPhilRes	0	6	1	0	0	0	1	3	1	1
MSc coursework	4	5	6	2	3	3	6	11	13	9
PhD	4	7	6	6	3	2	2	3	1	4
Curtin University Geophysics 2008-2010)										
BSc Geophysics Major					9	20	20	22	7	18
BSC Hons					5	10	8	20	16	4
Grad Diplomas						4	2	6		
MSc/MPhilRes						0	1	0	2	0
MSc coursework									7	7
PhD						1	4	2	2	2

Table 6 continued

University / Degree	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Flinders University - no data BSC and for 2011-12										
BSc Geoscience Major					*9*	*9*	*12*	*9*	*9*	*9*
BSC Hons					*4*	*12*	*12*	*9*	*9*	*9*
MSc/MPhilRes										
MSc coursework						3	1	2	*2*	*2*
PhD						2	0	6	*4*	*4*
James Cook University										
BSc Geoscience Major					15	10	10	10	13	24
BSC Hons					10	6	9	1	1	10
MSc/MPhilRes	3	4	1	0	0	0	1	1		
MSc coursework	2	3	4	3	8	1	3	4	22	11
PhD	3	10	12	16	9	8	3	4	3	3
La Trobe University - No BSc data										
BSc Geoscience Major					*18*	*18*	*18*	*18*	*9*	*6*
BSC Hons					7	5	1	5	3	2
MSc/MPhilRes										
MSc coursework										
PhD	1	2	2	2	2	0	1	1	0	1
Macquarie University - limited BSc data										
BSc Geoscience Major					*12*	*13*	*9*	*11*	18	22
BSC Hons					4	6	5	15	5	10
MSc/MPhilRes	2		1		1					
MSc coursework					1	2	6	4	9	17
PhD	3		5	5	4	6	8	5	5	3
University of Melbourne										
BSc Geoscience Major					42	42	45	32	34	32
BSC Hons					22	28	19	16	11	9
MSc/MPhilRes										
MSc coursework				1	1			6	12	13
PhD	10	9	8	8	9	7	10	4	4	6

Table 6 continued

University / Degree	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Monash University										
BSc Geoscience Major					66	63	69	67	73	115
BSC Hons					15	28	21	31	32	27
MSc/MPhilRes	3	3	2	2	2	4	2	2	2	1
MSc coursework										
PhD	8	5	5	2	2	10	7	5	3	5
University of New England										
BSc Geoscience Major					*7*	*5*	*5*	*4*	*12*	*11*
BSC Hons					*2*	*2*	*1*	*1*	*3*	*3*
MSc/MPhilRes										
MSc coursework										
PhD	1		3							
University of Newcastle										
BSc Geoscience Major					31	*21*	*27*	*27*	*27*	*27*
BSC Hons					*5*	*2*	*2*	*3*	*3*	*3*
MSc/MPhilRes										
MSc coursework										
PhD	0	3	2	3	1	2	3	3	*2*	*2*
University of New South Wales										
BSc Geoscience Major					12	14	15	15	16	18
BSC Hons					11	6	10	11	13	16
MSc/MPhilRes	3	3	6	3					2	2
MSc coursework										
PhD	4	3	1	2	3	3	4	5	4	6
University of Queensland										
BSc Geoscience Major					21	29	34	34	45	52
BSC Hons					4	2	4	13	8	8
MSc/MPhilRes	2			4		1		1	0	0
MSc coursework					0	0	0	0	1	5
PhD	5	5	7	6	0	3	2	3	4	11
Queensland University of Technology										
BSc Geoscience Major					15	13	11	27	15	22
BSC Hons					3	1	2	3	3	3
MSc/MPhilRes	2	5	1	2			1	2	3	2
MSc coursework										
PhD	0	5	1	2	1	1	2	2	4	*2*
RMIT University										
BSc Geophysics Major										
BSC Hons					1	0	1	4	2	1
MSc						1	0	0	0	0
PhD						0	1	1	0	0

Table 6 continued

University / Degree	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
University of Sydney										
BSc Geoscience Major					*12*	*11*	*14*	*14*	*14*	*14*
BSC Hons					*8*	*8*	*10*	*8*	*8*	*8*
MSc/MPhilRes	4	3	3	2	3	3	2	2	*2*	*2*
MSc coursework										
PhD	5	7	4	6	4	1	3	7	*5*	*5*
University of Tasmania										
BSc Geoscience Major					36	28	41	46	44	53
BSC Hons					8	7	16	15	16	19
MSc/MPhilRes					1	0	0	1	1	1
MSc coursework	1		2	1	1	4	7	2	0	4
PhD	7	9	2	1	8	9	5	7	6	6
University of Western Australia										
BSc Geoscience Major					21	36	42	45	38	55
BSC Hons					10	9	10	21	19	22
MSc/MPhilRes	1	6	3	3	3				1	2
MSc Econ Geolo/Geochem						2	1	3	9	17
PhD	12	10	9	5	4	1	3	1	3	6
University of Wollongong										
BSc Geoscience Major				no data					49	36
BSC Hons									6	10
MSc/MPhilRes										
MSc coursework									5	6
PhD	3	6	3	6	3	7	6	7	3	7
National Total										
BSc Geoscience Major					375	406	475	527	568	690
BSC Hons					157	179	189	251	237	241
MSc/MPhilRes	19	30	18	18	11	6	7	11	12	9
MSc coursework	10	10	13	10	16	25	32	43	90	100
PhD	84	94	83	88	73	76	81	83	66	95

Table 7: Teaching and research positions at Australian Universities at end of 2012.

* Denotes data derived from school websites; ** Denotes 2010 figures used;
*** 21 casual demonstrators drawn from research students not recorded here.

Teaching Positions	Total	Funding Source			**Research positions**	Total	Funding Source		
		University		External			University		External
		Perm.	Term Position				Perm.	Term Positions	
	FTE	FTE	FTE	FTE		FTE	FTE	FTE	FTE
University of Adelaide (Earth and Environmental Sciences)									
Professor	5	5			Professor	1			1
Associate Professor	2	2			Professorial Fellow	0.5			
Senior Lecturer	2	2			Prin Research Fellow				
Lecturer	3		3		Senior Research fellow	1			1
Demonstrator	1	1			Research Fellow	0.5	0.5		
Total	13	10	3	0	Research Associate	6			6
2012 EFTSL/Staff	**40.3**				**Total**	9	0.5	0	8
University of Adelaide (Australian School of Petroleum)									
Professor	1.2		0.2	1	Professor	0.8			0.8
Associate Professor					Professorial Fellow	0.5			0.5
Senior Lecturer	1.8	1.6	0.2		Prin. Research Fellow				
Lecturer	2.0	2			Senior Research fellow	2.6			2.6
Demonstrator					Research Fellow	1			1
Total	**5.0**	3.6	0.4	1	Research Associate	1			1
					Total	5.9			5.9
Australian National University * **									
Professor					Professor	15	14		1
Associate Professor	2	2			Professorial Fellow	0			
Senior Lecturer	1	1			Prin. Research Fellow	18	11		7
Lecturer	1			1	Snr Research fellow	12	4		8
Demonstrator	1			1	Research Fellow	10	2		8
Total	5	3	0	2	Research Associate	9			9
2012 EFTSL/Staff	**16.2**				Total	64	31	0	33
University of Ballarat									
Professor					Professor				
Associate Professor	0.5	0.5			Professorial Fellow				
Senior Lecturer	1	1			Prin. Research Fellow				
Lecturer	4	2	2		Snr Research fellow	1			1
Demonstrator					Research Fellow				
Total	5.5	3.5	2		Research Associate				
2012 EFTSL/Staff	**14.2**				Total	1			1
University of Canberra									
Professor	1.0	1.0			Professor				
Associate Professor	1.0	1.0			Associate Professor				
Senior Lecturer	1.0		1		Senior Lecturer				
Lecturer					Total				
Demonstrator									
Total	**3.0**	2.0	1						
2012 EFTSL/Staff	**21.7**								

Table 7 continued

Teaching Positions	Total	Funding Source			**Research positions**	Total	Funding Source		
		University		External			University		External
		Perm.	Term Position				Perm.	Term Positions	
	FTE	FTE	FTE	FTE		FTE	FTE	FTE	FTE
Curtin University (Applied Geology)									
Professor	6	6			Professor	0			
Associate Professor	3	3			Profesorial Fellow	2		0.5	1.5
Senior Lecturer	2	1.5	0.5		Prin. Research Fellow	0			
Lecturer	4	3	1		Snr Research fellow	7		3	4
Demonstrator	0				Research Fellow	7		4	3
Total	15	13.5	1.5		Total	16		7.5	8.5
2012 EFTSL/Staff	**15.33**								
Curtin University (Exploration Geophysics)*									
Professor	1	1			Professor				
Associate Professor	5	5			Profesorial Fellow				
Senior Lecturer					Prin. Research Fellow				
Lecturer					Snr Research fellow	1			
Demonstrator					Research Fellow	9			
Total	6	6			Research Associate	3			
2012 EFTSL/Staff	**11.50**				Total	13			
Flinders University*									
Professor	4				Professor	4			
Associate Professor	1				Profesorial Fellow				
Senior Lecturer	2				Prin. Research Fellow				
Lecturer	2				Snr Research fellow	4			
Demonstrator					Research Fellow	5			
Total	9	9			Total	13			
2012 EFTSL/Staff									
James Cook University									
Professor	3	3			Professor				
Associate Professor	1	1			Snr Research fellow	1			1
Senior Lecturer	5	5			Research Fellow	3			3
Lecturer	4	4			Research Associate	0			
Demonstrator	0								
Total	13	13			Total	4	0		4
2012 EFTSL/Staff	**12.2**								
La Trobe University									
Professor					No Research positions				
Associate Professor	1.0	1							
Senior Lecturer									
Lecturer	1.0		1						
Demonstrator									
Total	**2.0**	1	1						
2012 EFTSL/Staff	**17.0**								
Macquarie University									
Professor	1	1			Professor	3	3		
Associate Professor	4	4			Prin. Research Fellow	4			4
Senior Lecturer	5	5			Snr Research fellow	1	0.5		0.5
Lecturer					Research Fellow	2	2		
Total	10	10			Research Associate	3	3		
2012 EFTSL/Staff	**22.7**				Total	13	8.5	0	4.5

Table 7 continued

Teaching Positions	Total	Funding Source			**Research positions**	Total	Funding Source		
		University		External			University		External
		Perm.	Term Position				Perm.	Term Positions	
	FTE	FTE	FTE	FTE		FTE	FTE	FTE	FTE
University of Melbourne									
Professor	4	4			Professor	1.5		1.5	
Associate Professor	3	3			Professorial Fellow	4.4		0.4	4
Senior Lecturer	0.25	0.25			Prin. Research Fellow	0			0
Lecturer	2	1	1		Snr Research fellow	1			1
Demonstrator	0.5		0.5		Research Fellow	8.5		1	7.5
Total	9.75	8.25	1.5		Research Associate	10.25			10.25
2012 EFTSL/Staff	**11.8**				Total	25.65	0	2.9	22.75
Monash University									
Professor	2.7	2.7			Professorial Fellow	0.2			0.2
Associate Professor	3	3			Principle Research Fello	1			1
Senior Lecturer	1	1			Snr Research fellow	0.5			0.5
Lecturer	5	2	3		Research Fellow	4		1	3
Total	11.7	8.7	3	0	Research Associate	4		2	2
2012 EFTSL/Staff	**20.34**				Total	9.7	0	3	6.7
University of New England									
Associate Professor	1	1							
Lecturer	2.5	2.5			No Research positions				
Total	3.5	3.5							
2012 EFTSL/Staff	**22**								
University of Newcastle**									
Professor	*1*								
Associate Professor	*2*				Research Fellow	*4*			
Senior Lecturer	*1*				Research Associate	*0.5*			
Lecturer	*4.6*								
Total	*8.6*	*8.6*			Total	*4.5*			
2012 EFTSL/Staff									
University of New South Wales *									
Professor	4	4			Professor	1	1		
Associate Professor	5	5			Professorial Fellow	2			2
Senior Lecturer	4	4			Senior Research Fellow	3			3
Lecturer	2	1		1	Research Fellow	2			2
Demonstrator	0	0							
Total	15	14	0	1					
2010 EFTSL/Staff	**13.9**				Total	8	1	0	7

Table 7 continued

Teaching Positions	Total	Funding Source			**Research positions**	Total	Funding Source		
		University		External			University		External
		Perm.	Term Position				Perm.	Term Positions	
	FTE	FTE	FTE	FTE		FTE	FTE	FTE	FTE
University of Queensland									
Professor	5	3		2	Professor	0			
Associate Professor	3	3			Professorial Fellow	0			
Senior Lecturer	1.6	1.6			Prin. Research Fellow	1			1
Lecturer	4	2	1	1	Snr Research fellow	0			
Demonstrator	0.6		0.6		Research Fellow	4			4
Total	14.2	9.6	1.6	3	Research Associate	8		1	7
2012 EFTSL/Staff	**16.1**				Total	13		1	12
Queensland University of Technology									
Professor	3	3			Professor	1		1	
Associate Professor	0	0			Professorial Fellow	0			
Senior Lecturer	3	3			Principle Research Fello	0			
Lecturer	5	4	1		Senior Research Fellow	3	3		
Total	11	10	1	0	Research Fellow	2	1		1
2012 EFTSL/Staff	**8.5**				Total	6	4	1	1
RMIT University									
Professor	0.5				Professor		0.5		
					Research Fellow				
					Research Associate	1.2			1.2
Total	0.5				Total	1.7			**1.2**
University of Sydney *									
Professor	2	2			Professor	1			1
Associate Professor	4	4			Prin. Research Fellow	2			2
Senior Lecturer	4	4			Post Doctoral Fellow	6			6
Demonstrator	0				Research Associate				
Total Geoscience	10	10			Total Geoscience	9			9
2012 EFTSL/Staff									
University of Tasmania									
Professor	1.7	1.7			Professor	5.3	3.8		1.5
Associate Professor	0.5	0.5			Prin. Research Fellow	2	2		
Senior Lecturer	2.5	2		0.5	Snr Research fellow	3.5			3.5
Lecturer	0				Research Fellow	14.85			14.85
Demonstrator	0				Research Associate	0			
Total	4.7	4.2	0	0.5	Total	25.65	5.8	0	19.85
2012 EFTSL/Staff	**17.23**								

Table 7 continued

Teaching Positions	Total	Funding Source			**Research positions**	Total	Funding Source		
		University		External			University		External
		Perm.	Term Position				Perm.	Term Positions	
	FTE	FTE	FTE	FTE		FTE	FTE	FTE	FTE
University of Western Australia									
Professor	4	4			Professor	3			3
Associate Professor	3	3			Professorial Fellow	0			
Senior Lecturer	3	2		1	Prin. Research Fellow	1			1
Lecturer	4	2		2	Snr Research fellow	3	1		2
Demonstrator	0				Research Fellow	11			11
Total	14	11	0	3	Research Associate	1			1
2012 EFTSL/Staff	**11.5**				Total	19	1	0	18
University of Wollongong *									
Professor	5	4			Professorial Fellow	1			
Associate Professor	3	3			Principal Research Fello	2			
Senior Lecturer	2	2			Senior Reseach Fellow	2			
Lecturer	1	1			Research Fellow	1			
Demonstrator/AssLlectu	1				Associate Research Fell	3			
Geoscience Teaching	10	10			Geoscience Research	9			
2012 EFTSL/Staff	**15.9**								
National									
Total	**199.5**	**172.5**	**16.0**	**10.5**		**270.1**	**51.8**	**15.4**	**162.4**
Overall EFTSL/Staff	**16.2**								

Australian Geoscience Council Inc.

The Council of Earth Science Societies in Australia

Australian Geoscience Tertiary Education Profile 2012

The following questionnaire is designed to extend the Australian Geoscience Tertiary Education Profile as a health check on our national geoscience teaching and research capability and is the third such survey. The Australian Geoscience Council (AGC) conducted the first survey in 2007 because of concern about ability of the higher educational system to provide the appropriately trained geoscientists required by the economy and Australian society, and the capability to educate Australian society about the discipline of geoscience into the future. The report of the two previous surveys can be found at www.agc.org.au. (see Reports Tab). This third survey is intended to update these previous surveys and provide an updated and authoritative reference to geoscience trends in Australian Universities.

The purpose of the survey is 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.
- Obtain indications of the viability of earth science at Australian Tertiary Institutions and their capability

Please contact Dr Trevor Powell (email below or ph 02 62514128; Mobile 0422 089 532) regarding any questions concerning the completion of this questionnaire.

Please return to Dr Trevor Powell, *STIR* Science Services, 15 Jaeger Circuit Bruce Canberra ACT, 2617 or via e-mail to tpowell@grapevine.net.au by 31st May 2013

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

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 prescribed options? eg Give titles

2. Are you able to offer PhD degrees?

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

4. 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?

5. 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 2012	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 2012	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 2012	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 three 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**	**2011 No's**	**2012 No's**
Year 1 **-**			
Year 2 **-** **-**			
Year 3 **-** **-**			
Year 4 – Honours **-** **-**			

Geoscience Post graduates – completed degree
If we could crave your indulgence, this year we are asking for numbers of actual batchelor graduates from 2007 to cross check with data collected by Australian Institute of Geoscientists on levels of industry employment of geoscientist graduates.

Degree	2007 No's	2008 No's	2009 No's	2010 No's	2011 No's	2012 No's
Batchelor Degree with geoscience major						
Batchelor Degree with geoscience honours						
MSc by Coursework	Not required	Not required	Not required	Not required		
MSc by Research	Not required	Not required	Not required	Not required		
PhD	Not Required	Not Not required	Not required	Not required		

Not required denotes data to hand from previous surveys

THANK YOU FOR COMPLETING THIS SURVEY
Please return to:
Dr Trevor Powell, 15 Jaeger Circuit Bruce Canberra ACT 2617
or via e-mail to tpowell@grapevine.net.au by 31st May 2013

EXTRACT FROM AUSTRALIAN AND NEW ZEALAND STANDARD RESEARCH CLASSIFICATION ABS 2008

DIVISION 04 EARTH SCIENCE

0401 Atmospheric Sciences (not included)

0402 Geochemistry
- 040201 Exploration Geochemistry
- 040202 Inorganic Geochemistry
- 040203 Isotope Geochemistry
- 040204 Organic Geochemistry
- 040299 Geochemistry not elsewhere classified

0403 Geology
- 040301 Basin Analysis
- 040302 Extraterrestrial Geology
- 040303 Geochronology
- 040304 Igneous and Metamorphic Petrology
- 040305 Marine Geoscience
- 040306 Mineralogy and Crystallography
- 040307 Ore Deposit Petrology
- 040308 Palaeontology (incl. Palynology)
- 040309 Petroleum and Coal Geology
- 040310 Sedimentology
- 040311 Stratigraphy (incl. Biostratigraphy and Sequence Stratigraphy)
- 040312 Structural Geology
- 040313 Tectonics
- 040314 Volcanology
- 040399 Geology not elsewhere classified

0404 Geophysics
- 040401 Electrical and Electromagnetic Methods in Geophysics
- 040402 Geodynamics
- 040403 Geophysical Fluid Dynamics
- 040404 Geothermics and Radiometrics
- 040405 Gravimetrics
- 040406 Magnetism and Palaeomagnetism
- 040407 Seismology and Seismic Exploration
- 040499 Geophysics not elsewhere classified

0405 Oceanography (not included)

0406 Physical Geography and Environmental Geoscience
- 040601 Geomorphology and Regolith and Landscape Evolution
- 040602 Glaciology
- 040603 Hydrogeology
- 040604 Natural Hazards
- 040605 Palaeoclimatology
- 040606 Quaternary Environments
- 040607 Surface Processes
- 040608 Surfacewater Hydrology
- 040699 Physical Geography and Environmental Geoscience not elsewhere classified

0499 Other Earth Sciences

060206 Palaeoecology