

Geology Master's Program, Cal Poly Pomona

Self-Study Report April 6, 2016

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Section 1 – Introduction

(a) Describe the program, including in which department and college it resides, the degree granted, and any emphases or options within the program.

A. Program Description and Executive Summary

Our Geology Master’s program is finishing its fourth year within the Geological Sciences Department of the College of Science. We award an MS degree in Geology based on 45 quarter units, including a 9 unit thesis sequence as the culminating experience.

Originally approved by Chancellor Reed in 2010 as a traditional state-funded graduate program, the former Cal Poly Pomona Provost allowed start up in Fall 2012 only with the condition that it operate under a self-support funding model. Our MS program has been very successful in terms of multiple metrics: student demand, enrollment, diversity, advising and mentoring, unique faculty and research opportunities, external funding, professional growth of students, degrees awarded, and placement of graduates. However, the university-imposed self-support business model, originally posed as an experiment, has been a financial failure. The program has run serious deficits since its inception that required subsidy by the Dean of the College of Science. The higher fees have also inhibited growth and restricted access to program for highly qualified, underrepresented students with limited finances.

This self-study describes the strengths and accomplishments of the Geology MS degree program since its inauguration in 2012. We detail our many successes and efforts to grow the program. We also spell out the fiscal and logistical issues that have been challenges from the beginning. Section 6—Suggestions for Action-- outlines a proactive plan for continuing in a fiscally responsible manner. We present a proposal to move the Master’s program back to a state-support in concert with offering a blended 5-year BS-MS degree program. Approval of this plan will yield a self-sustaining graduate program with enrollments fueled by a continuous stream of highly-motivated undergraduate students from our flourishing Geology BS program. We envision additional benefits that include: 1) a peer mentoring system in which graduate students engage a future cohort of undergraduates, 2) shorter time to degree, 3) higher enrollments in graduate courses, 4) increased program efficiency, and 5) recognition and support as a “Promising Practices” program by the Chancellor’s Office.

(b) List the mission and goals and discuss their relationship to those of the college and University.

B. Mission and Goals of the Geology MS Program

Mission Statement:

The Geological Sciences Department aspires to provide the highest quality education in Earth Science and its applications. Through hands-on learning methods, faculty-mentored research, and exposure to current technology, students shall acquire skills applicable to careers in Geoscience and related disciplines. The Department's programs emphasize understanding of Earth system processes and their interrelationships, thereby providing students a global perspective needed for problem solving, decision making, and leadership roles in a rapidly-changing world confronted with environmental challenges and geo-hazards.

Goals of the Geology MS Program:

We aim to guide students through a thesis-based Master's degree program that develops high level knowledge, practical skills and research experience needed for placement in competitive PhD programs and employment in the geoscience industry or teaching.

Relationship of Mission and Goals to those of the College of Science and University

Our Mission and Goals align with the College and University stated emphases on academic excellence, practical learning experiences, research, interdisciplinary studies, and community engagement.

(c) Review of previous self-study, its recommendations, and resulting changes.

C. Previous Self Study

N/A; this is the first self-study of our Geology Master's program

Section 2 – The Program Description

This section should fully describe the program and its role in helping the University achieve its overall mission.

(a) Review the units to degree. If the degree program being reviewed is deemed to require more than 180-quarter units, academic reasons for continuing such practice should be presented.

A. Units to Degree

The Geology MS degree requires 45 quarter units, subdivided into required core, restricted electives, and thesis units as outlined below.

(b) List the curriculum (core, directed electives, emphasis areas, minors, etc.). Updated expanded course outlines (no more than five years old) for all courses must be on file in the department office and available to reviewers.

B. Graduate Curriculum

To earn a Master's degree in Geology, students must complete 45 quarter units as specified below. Course descriptions and learning outcomes are listed at:

<http://geology.cpp.edu/GradCourses.pdf>

Below is the curriculum as of 2015-16, with primary instructors indicated:

- ***Required Core Courses (5 units):***

GSC 501 Advanced Topics in Geosciences (3)—team taught by all six full-time faculty

GSC 503L Field Investigations (2)—Nourse and Van Buer

- ***Culminating Experience (9 units):***

GSC 600 Thesis Proposal (1)—supervised by individual faculty members

GSC 694 Thesis Research (5) —supervised by individual faculty members

GSC 696 Master's Degree Thesis (3) —supervised by individual faculty members

- **Technical Elective Courses (31 units; at least 16 units must be 500 level):**

- GSC 410 Earth Science Seminar (2)—Osborn and Polet
- GSC 401/L GIS Applications for Earth and Environmental Scientists I (1/2)--Nourse
- GSC 411/L GIS Applications for Earth and Environmental Scientists II (1/2)--Nourse
- GSC 415/L Engineering Geology II (3/1)—Nourse and adjuncts
- GSC 423/L Sedimentary Geology (3/2)--Murray
- GSC 424 Igneous and Metamorphic Petrology (3—Van Buer
- GSC 425L Igneous and Metamorphic Petrology Lab (2)—Van Buer
- GSC 432/L Soil Physics (3/1)--Osborn
- GSC 433/L Ore Deposits (3/1)--Jessey
- GSC 434/L Shallow Subsurface Geophysics (3/1)--Polet
- GSC 440/L Exploration and Mining Geology (3/1)--Jessey
- GSC 444/L Geotectonics (3/1)—Nourse and Van Buer
- GSC 450/L Introduction to Seismology, Earthquakes and Earth Structure (3/1)--Polet
- GSC 491L Field Module (2)—Nourse, Van Buer, Polet, and Murray
- GSC 495 Planetary Geology (4)—Adjunct
- GSC 499/L/A Special Topics for Undergraduate and Graduate Students (1-4)
- GSC 534/L Quaternary Geology (3/1)--Marshall
- GSC 541/L Micropaleontology (3/1)--Berry
- GSC 545/L Advanced Hydrogeology (3/1)--Osborn
- GSC 551/L Petroleum Geology (3/1)--Adjunct
- GSC 564/L Advanced Shallow Subsurface Geophysics (3/1)--Polet
- GSC 568/L Topics in Advanced Seismology (3/1)--Polet
- GSC 575/L Contaminant Transport (3/1)--Osborn
- GSC 599/L/A Special Topics for Graduate Students (1-4); examples include
 Isotope Geochemistry; Volcanology; Advanced Structural Geology/Tectonics;
 Advanced Topics in Sedimentology/Stratigraphy; Geochronology

(c) *List the service learning and honors courses that have been incorporated into the curriculum. Discuss their role in the program.*

N/A

(d) *List GE or other service classes offered by the department that are not part of major program. Discuss their role in the department in relationship to the major program.*

N/A

(e) *Compare the curriculum in terms of content and distribution of units with comparable programs at other CSU and non-CSU institutions.*

Our 45 quarter unit (equivalent to 30 semester units) curriculum is similar to other MS programs in the CSU and nationwide. It is also standard to require a Master's thesis as the culminating experience. Professional Master's programs that offer a collection of graduate courses to geoscience industry professionals but do not require a thesis are rare.

(f) *Discuss any major curricular changes made in the past five years.*

F. Curriculum Changes in Past Four Years

Several new courses have been developed and added to the curriculum in response to three new faculty hires since original approval of the MS program in 2011. These courses include:

- GSC 432/L Soil Physics (3/1)—taught by Dr. Osborn Fall 2013 and Winter 2015
- GSC 575/L Contaminant Transport (3/1)--taught by Dr. Osborn Spring 2013, Fall 2014
- GSC 599 Isotope Geochemistry (4)—taught by Drs. Van Buer and Osborn Fall 2015
- GSC 499/L Volcanology (3/1)—taught by Drs. Polet and Van Buer Winter 2016

(g) *Discuss the anticipated evolution of the curriculum. Describe the external needs/demands for the program. Describe how new ideas, directions, and technical advances have been incorporated into the curriculum. Discussion should include comparisons, as relevant, to college, university, CSU, and national trends and needs.*

G. Anticipated Program Evolution, etc.

Semester Conversion: The primary curriculum change in the near future is conversion from a 10-week quarter to 15-week semester system, slated to begin August 2018. Our plan for conversion has been approved by the College of Science Curriculum Committee and Dean of Science, and is currently being reviewed by the Office of Academic Programs. Most courses will be converted from (3/1) lecture/laboratory combinations to (2/1). The proposed new curriculum is outlined below:

Table 1a. CURRICULUM SHEET FOR SEMESTER CONVERSION

Program Name: Geology MS			
Total Units: 30			
Program Core – Units: 6			
Course Number	Title	Units (lecture/lab)	Revised or New?
GSC 4100	Presentation, Writing and Research Skills in the Geosciences	2	N
GSC 5010	Advanced Topics in Geosciences	2	R
GSC 5030L	Field Investigations	1	R
GSC 6000	Thesis Proposal	1	R
Program Capstone – Units: 5			
Course Number	Title	Units (lecture/lab)	Revised or New?
GSC 6940	Thesis Research	4	R
GSC 6960	Master’s Degree Thesis	1	R
Restrictive Elective Courses – Units: 19; 12 of these units must be 500 level			
Course Number	Title	Units (lecture/lab)	Revised or New?
GSC 4010/L	GIS Applications for Earth and Environmental Scientists	1/2	R
GSC 4150/L	Engineering Geology II	2/1	R
GSC 4230/L	Sedimentary Geology	2/1	R
GSC 4240/L	Igneous and Metamorphic Petrology	2/2	R
GSC 4320/L	Soil Physics	2/1	R
GSC 4410/L	Mining and Exploration Geology	2/1	R
GSC 4340/L	Shallow Subsurface Geophysics	2/1	R

GSC 4400/L	Geotectonics	2/1	R
GSC 4500/L	Introduction to Seismology, Earthquakes and Earth Structure	2/1	R
GSC 4700/L	Volcanology	2/1	N
GSC 4800/L	Quantitative and Computer Skills in Geosciences	3	N
GSC 4910/L	Field Module	1-2	R
GSC 4950	Planetary Science	3	R
GSC 499/L/A	Special Topics for Upper Division Students	1-3	R
GSC 5330/L	Advanced Topics in Structural Geology/Tectonics	2/1	N
GSC 5340/L	Quaternary Geology	2/1	R
GSC 5450/L	Advanced Hydrogeology and Contaminant Transport	2/1	R
GSC 5510/L	Petroleum Geology	2/1	R
GSC 5640/L	Advanced Shallow Subsurface Geophysics	2/1	R
GSC 5680/L	Topics in Advanced Seismology	2/1	R
GSC 5850/L	Isotope Geochemistry	2/1	N
GSC 5950/L	Advanced Topics in Sedimentology / Stratigraphy	2/1	N
GSC 5990/L/A	Special Topics for Graduate Students	1-3	R

Our new graduate curriculum reflects recent changes in faculty expertise resulting from three new hires that replaced retiring faculty members. Courses to be dropped or consolidated during semester conversion are:

- GSC 411/L GIS Applications for Earth and Environmental Scientists II –content to be integrated into one GIS course: GSC 4010/L GIS Applications for Earth and Environmental Scientists
- GSC 433/L Ore Deposits—due to retirement of Dr. David Jessey
- GSC 541/L Micropaleontology—due to retirement of Dr. David Berry
- GSC 575/L Contaminant Transport—content to be integrated into GSC 5450/L Advanced Hydrogeology

Five new courses are proposed, with instructors indicated:

- GSC 4700/L Volcanology (2/1)—Van Buer and Polet
- GSC 4800 Quantitative and Computer Skills in Geosciences (4)--Polet
- GSC 5330/L Advanced Topics in Structural Geology/Tectonics (2/1)—Nourse and Van Buer
- GSC 5850/L Isotope Geochemistry (2/1)—Osborn and Van Buer
- GSC 5950/L Advanced Topics in Sedimentology/Stratigraphy (2/1)--Murray

Technological Advances: Our Master’s program continues to evolve and modernize as we acquire equipment and instrumentation that is incorporated into the curriculum and faculty-mentored thesis research projects. Below is the equipment acquired since program inauguration:

- Ford Transit Wagon: 10-passenger van to support field trips
- Upgrades to student computer lab (12 new work stations plus miscellaneous software)
- SMART Board for room 4-A-634 classroom/laboratory

- SMART Board and major audio-visual upgrade for the heavily utilized lower division Geology teaching laboratory in room 4-A-608
- Ford E-350: 12-passenger van to support field trips
- Electrical Resistivity surveying equipment with accessories
- Five Tru-Pulse laser range-finders capable of measuring azimuth and horizontal and vertical distance as far away as 2000 m
- Milli-Q Ultra-Pure water purification system to link with our Ion Chromatograph
- Eight field-deployable Guralp seismometers—we now have eleven, making it possible to deploy a dense array of instruments (or possibly two separate arrays) for detailed micro-seismicity studies
- Portable Gem Systems magnetometer to conduct field surveys of magnetic field variation
- A Gemini gravity separation shaker table to separate zircon, sphene and apatite crystals for radiometric dating
- A BICO rock pulverizer for preparation of samples for heavy mineral separation
- New water-lubricated rock saw for thin section preparation SPEX Shatterbox to rapidly powder samples for X-ray analysis
- Upgraded software (FastScan Super Q version 5) and new Windows 7-based computer for the Xray fluorescence spectrometer
- Various well-sampling equipment: pressure transducers, temperature probes, data loggers
- Various Hand-held water quality meter (conductivity, pH, etc.)
- Three water velocity flow probes (we now have seven in our arsenal, expanding the possibilities for stream flow measurement with large hydrology classes)
- Fifteen hand-held GPS receivers, bringing our total up to 25
- Eight “brunton” compasses for the Engineering Geology laboratory
- Five Nikon digital cameras with GPS tagging and movie-making capabilities
- 4 new desktop PCs with laser printers for the graduate student office
- A double-ring infiltrometer for soil permeability experiments
- We repaired one of our two Nikon Total Stations that had a failed EDM detector circuit board
- 8 groundwater flow models for classroom demonstration of drawdown effects during pumping

Anticipated Employment Trends: Our MS program has adapted to anticipated employment trends in the geosciences documented in annual workforce reports by the American Geosciences Institute (AGI). <http://www.americangeosciences.org/workforce> . We have identified three “Employment Niches”: *Water Quality / Water Resources*, *Geophysics / Earth Exploration*, and *Energy / Mineral Resources* to channel student interests and direct them to courses that will provide marketable skills. The curriculum tracks outlined in **Table 1** below show how these employment niches are addressed by our current course offerings. Listed at the bottom are courses not currently part of the curriculum that have been piloted or are being developed.

Table 1b: Geology MS Curriculum Tracks-- Three Hot Employment "Niches"		
<i>Required Graduate Core and Thesis Courses (14 units)</i>		
Course Number	Course Name	Units
GSC 501	Advanced Topics in Geosciences	3
GSC 503L	Field Investigations	2
GSC 600	Thesis Proposal	1
GSC 694	Thesis Research	5
GSC 696	Masters Degree Thesis	3
Subtotal		14
1. Technical Electives for Water Quality / Water Resources Track		
(31 units; 16 units must be 500-level courses)		
Course Number	Course Name	Units
GSC 545/L	Advanced Hydrogeology	4
GSC 575/L	Contaminant Transport	4
GSC 534/L	Quaternary Geology	4
*GSC 599/L/A	Special Topics for Graduate Students	4
Subtotal		16
GSC 432/L	Soil Physics	4
RS 414/L	Watershed Restoration	4
GSC 401 or GSC 411	GIS Applications for Earth and Environmental Scientists I or	3
GSC 410	Earth Science Seminar	2
GSC 491L	Field Module	2
Subtotal		15
2. Technical Electives for Geophysics / Earth Exploration Track		
(31 units; 16 units must be 500-level courses)		
Course Number	Course Name	Units
**GSC 564/L	Advanced Shallow Subsurface Geophysics	4
**GSC 568/L	Topics in Advanced Seismology	4
GSC 545/L	Advanced Hydrogeology	4
*GSC 599/L/A	Special Topics for Graduate Students	4
Subtotal		16
GSC 434/L	Shallow Subsurface Geophysics	4
GSC 450/L	Introduction to Seismology, Earthquakes and Earth Structure	4
GSC 432/L	Soil Physics	4
GSC 401 or GSC 411	GIS Applications for Earth and Environmental Scientists I or	3
GSC 415/L	Engineering Geology II	4
GSC 495	Planetary Science	4
Subtotal		15
3. Technical Electives for Energy / Mineral Resources Track		
(31 units; 16 units must be 500-level courses)		
Course Number	Course Name	Units
GSC 551/L	Petroleum Geology	4
GSC 534/L	Quaternary Geology	4
GSC 545/L	Advanced Hydrogeology	4
*GSC 599/L/A	Special Topics for Graduate Students	4
Subtotal		16
GSC 433/L	Ore Deposits	4
GSC 440/L	Exploration and Mining Geology	4
GSC 491L	Field Module	2
GSC 401 or GSC 411	GIS Applications for Earth and Environmental Scientists I or	3
GSC 410	Earth Science Seminar	2
Subtotal		15
Total Units for MS Geology Degree		45
<i>*Special Topics GSC 599 courses to be designed (depending on faculty expertise):</i>		
Isotope Geochemistry	Groundwater Modeling	
Volcanology	Advanced Topics in Structural Geology	
Geochronology	Advanced Topics in Sedimentology / Stratigraphy	
Geoinformatics	Neotectonics / Fault Trench Investigations	
**Take these courses if UG credit already earned in GSC 434/L and/or GSC 450/L		

(h) Discuss any curricular bottlenecks and efforts to alleviate such problems.

H. Curricular Bottlenecks

Last academic year (2014-15) we recognized that the final component of the culminating experience (GSC 696-Master' Thesis) is becoming a bottleneck for several students. The process of writing thesis drafts and submitting the final library-ready thesis document has taken too long. Several faculty meetings have addressed this issue to discuss possible solutions. We are all struggling with the fact that many students have poor technical writing skills. Also students appear to have little concept of the time commitment required to write and format a formal thesis document.

To correct these issues beginning 2015-16, Graduate Faculty have written several documents: that outlines the process, timeline, deadlines, and requirements for completing the Master's thesis. These documents are posted under "***Path To Graduation:***"

<http://www.cpp.edu/~sci/geological-sciences/masters-program/path-to-graduation.shtml> .

We also held an orientation session during the first week of Fall quarter 2015 for beginning and continuing graduate students. At that meeting we described the thesis process and referred students to the University Writing Center as a source of assistance with writing mechanics.

The Graduate Faculty undersatnd that proactive advising and regular meetings with students are key during the time when students are acquiring data related to their theses. We also plan to more rigorously enforce benchmarks and deadlines.

(i) Include a table indicating how often required and elective courses have been offered in the four years preceding the program review. Explain the reason for any courses that have not been offered at least every two years. (See example below)

I. Graduate Course Offerings and Enrollment Data 2012-2016

Table 2 below is a summary of all graduate courses taught in the Geology MS program over the past 4 years. The only courses not offered at least once every 2 years were GSC 433/L Ore Deposits, GSC 440/L Exploration and Mining Geology, and GSC 541/L Micropaleontology. These courses were part of the originally approved Master's curriculum. The faculty members with appropriate expertise have since retired.

Term	Course Number	Course Name	Units	FTES	Instructor	Enrollment
Fall 2012	RS 414/L	Watershed Restoration	4	7.5	Marshall	28
Fall 2012	GSC 501	Current Topics in Geosciences	3	1.8	All	9
Fall 2012	GSC 503L	Field Investigations	2	1.2	Nourse	9
Fall 2012	GSC 545/L	Advanced Hydrogeology	4	2.1	Osborn	8
Winter 2013	GSC 415/L	Engineering Geology II	4	8.8	Nourse, Polet, Roumelis	33
Winter 2013	GSC 410	Earth Science Seminar	2	4.1	Osborn	31
Winter 2013	GSC 434/L	Shallow Subsurface Geophysics	4	4.0	Polet	15
Winter 2013	GSC 491L	Field Module: Mine Mapping	2	2.7	Jessey	20
Winter 2013	GSC 534/L	Quaternary Geology	4	2.4	Marshall	9
Spring 2013	GSC 424	Igneous and Metamorphic Petrology	3	2.4	Jessey	12
Spring 2013	GSC 425L	Igneous and Metamorphic Petrology Lab	2	1.6	Jessey	12
Spring 2013	GSC 491L	Field Module: Blue Ridge, Mojave Desert	2	4.0	Nourse	30
Spring 2013	GSC 401L	GIS Applications for Earth and Environmental Scientists I	3	6.0	Wagner	30
Spring 2013	GSC 564/L	Advanced Shallow Subsurface Geophysics	4	4.0	Polet	15
Spring 2013	GSC 575/L	Contaminant Transport	4	3.5	Osborn	13
2012-13	GSC 600s	Thesis Supervisory Classes--Offered Every Quarter	0.5	0.9	All	28
2012-13 Totals				57.0	Average GSC 400-500 Class Size	19.6
Fall 2013	GSC 450/L	Intro to Seismology, Earthquakes&Earth Structure	4	2.9	Polet	11
Fall 2013	GSC 423/L	Sedimentary Geology	5	4.7	Caputo	14
Fall 2013	GSC 499/L	Soil Physics	4	2.9	Osborn	11
Fall 2013	GSC 501	Current Topics in Geosciences	3	2.4	All	12
Fall 2013	GSC 503L	Field Investigations	2	1.9	Nourse	14
Fall 2013	GSC 551/L	Petroleum Geology	4	5.1	Klonsky, Berry	19
Winter 2014	GSC 410	Earth Science Seminar	2	2.7	Osborn	20
Winter 2014	GSC 440/L	Mining and Exploration Geology	4	8.5	Jessey	32
Winter 2014	GSC 491L	Field Module: Anza Borrego	2	4.0	Nourse	30
Winter 2014	GSC 568/L	Advanced Topics in Seismology	4	3.2	Polet	12
Spring 2014	GSC 491L	Field Module: NW Mojave Desert	2	2.5	Nourse	19
Spring 2014	RS 414/L	Watershed Restoration	4	8.0	Marshall	30
Spring 2014	GSC 495	Planetary Science	4	6.7	Hendrix	25
Spring 2014	GSC 545/L	Advanced Hydrogeology	4	4.3	Osborn	16
2013-14	GSC 600s	Thesis Supervisory Classes--Offered Every Quarter	0.5	2.4	All	72
2013-14 Totals				62.1	Average GSC 400-500 Class Size	18.9
Fall 2014	GSC 491L	Field Module: Yellowstone Data Analysis	2	1.6	Polet	12
Fall 2014	GSC 411/L	GIS Applications for Earth and Environmental Scientists II	3	5.2	Nourse	26
Fall 2014	GSC 501	Current Topics in Geosciences	3	2.6	All	13
Fall 2014	GSC 503L	Field Investigations	2	1.5	Nourse	11
Fall 2014	GSC 575/L	Contaminant Transport	4	4.3	Osborn	16
Winter 2015	GSC 415/L	Engineering Geology II	4	9.6	Nourse, Roumelis, Martindale	36
Winter 2015	GSC 410	Earth Science Seminar	2	3.9	Osborn	29
Winter 2015	GSC 432/L	Soil Physics	4	5.9	Osborn	22
Winter 2015	GSC 434/L	Shallow Subsurface Geophysics	4	7.5	Polet	28
Winter 2015	GSC 491L	Field Module: Calico Mountains	2	3.1	Van Buer	23
Winter 2015	GSC 534/L	Quaternary Geology	4	2.7	Marshall	10
Spring 2015	RS 414/L	Watershed Restoration	4	6.7	Marshall	25
Spring 2015	GSC 444/L	Geotectonics	4	7.2	Van Buer, Nourse	27
Spring 2015	GSC 424	Igneous and Metamorphic Petrology	3	4.2	Van Buer	21
Spring 2015	GSC 425L	Igneous and Metamorphic Petrology Lab	2	2.8	Van Buer	21
Spring 2015	GSC 491L	Field Module: Anza Borrego and Towsley Cyn	2	2.9	Nourse	22
Spring 2015	GSC 564/L	Advanced Shallow Subsurface Geophysics	4	3.2	Polet	12
2014-15	GSC 600s	Thesis Supervisory Classes--Offered Every Quarter	0.5	3.0	All	90
2014-15 Totals				77.7	Average GSC 400-500 Class Size	22.1
Fall 2015	GSC 450/L	Intro to Seismology, Earthquakes&Earth Structure	4	6.7	Polet	25
Fall 2015	GSC 423/L	Sedimentary Geology	5	5.0	Murray	15
Fall 2015	GSC 501	Current Topics in Geosciences	3	1.6	All	8
Fall 2015	GSC 503L	Field Investigations	2	0.9	Van Buer	7
Fall 2015	GSC 599	Isotope Geochemistry	4	2.4	Osborn and Van Buer	9
Winter 2016	GSC 401/L	GIS Applications for Earth and Environmental Scientists I	3	6.6	Nourse	33
Winter 2016	GSC 410	Earth Science Seminar	2	4.7	Osborn	35
Winter 2016	GSC 491L	Field Module: Spring Mountains, NV	2	3.2	Van Buer	24
Winter 2016	GSC 499/L	Volcanology	4	7.2	Polet and Van Buer	27
Winter 2016	GSC 568/L	Advanced Topics in Seismology	4	2.9	Polet	11
Spring 2016	RS 414/L	Watershed Restoration	4	8.5	Marshall	32
Spring 2016	GSC 444/L	Geotectonics	4	7.2	Van Buer	27
Spring 2016	GSC 495	Planetary Geology	3	6.6	Phelps	33
Spring 2016	GSC 491L	Field Module: Calico Mountains	2	3.7	Murray	28
Spring 2016	GSC 545/L	Advanced Hydrogeology	4	3.7	Osborn	14
2015-16	GSC 600s	Thesis Supervisory Classes--Offered Every Quarter	0.5	2.2	All	65
2015-16 Totals				73.2	Average GSC 400-500 Class Size	21.9

Section 3 – Program Assessment

(a) Summarize the accreditation status or other external assessment of the program.

A. Accreditation Status or Other External Program Assessment

N/A. This is the first Academic Program Review of a young Master’s program. Nationwide, there is no officially recognized accreditation agency for Geology Master’s programs

(b) List the programs’ student learning outcomes

B. Geology MS Program Student Learning Outcomes

Graduates from the Geology Master’s degree program should be able to:

SLO 1) Participate effectively in seminar-style discussions of current Geoscience topics

SLO 2) Synthesize details of published Geoscience literature and present oral synopsis to graduate peers and faculty

SLO 3) Describe theory and applications of their chosen sub-discipline at an advanced level

SLO 4) Utilize contemporary equipment, laboratory techniques and computer technology to solve geologic problems

SLO 5) Develop and present scientific proposal for Master’s thesis

SLO 6) Conduct original research related to Master’s thesis

SLO 7) Write a Master’s thesis document

SLO 8) Defend results of Master’s thesis research with a formal oral presentation to graduate peers and thesis committee

(c) Include a matrix showing how courses in the program meet the student learning outcomes.

C. Relationship of Graduate Courses to Student Learning Outcomes

GSC Course	Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5	Outcome 6	Outcome 7	Outcome 8
GSC 501	I, D, M	I, D, M	I, D					
GSC 503L			I, D	I, D				
GSC 401/L			D, M	D, M				
GSC 410	I, D	I, D	I, D					
GSC 411/L			D, M	D, M				
GSC 415/L		D, M	D, M	D, M				
GSC 423/L			D	D				
GSC 424/L			D	D				
GSC 432/L		D	D	D				
GSC 433/L			D	D				
GSC 434/L		D	D	D				

GSC 440/L			D	D				
GSC 450/L	D	D	D	D				
GSC 491/L			D	D				
GSC 4950	D	D	D	D				
GSC 499/L/A	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
GSC 533/L	D	D	M	M				
GSC 534/L	D	D	M	M				
GSC 545/L	D	D	M	M				
GSC 551/L		D	M	M				
GSC 564/L	D	D	M	M				
GSC 568/L	D	D	M	M				
GSC 599/L/A	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
GSC 600		M	D		D, M			
GSC 694				Varies		D, M		
GSC 696		M		Varies			M	M

(d) Describe the process used for assessing the learning objectives, courses and curricular structures.

D. Assessment Methods

Graduate faculty apply a variety of assessment tools and methodologies to evaluate Student Learning Outcomes and courses of our Geology MS program. These methods have been developed and tested since inception of the program in 2012. From past experience, the assessment tools that yield most useful information include:

1. Analysis of Pre-test results relative to performance on similar questions during midterms and/or finals
2. Embedded examination questions that address specific learning outcomes
3. Rubrics developed by individual instructors to evaluate homework or laboratory assignments or term projects
4. Presentation rubrics to evaluate oral talks required in many of our courses
5. Student questionnaires given by instructors of certain courses to gather feedback about what worked in the course and what did not. These are implemented in conjunction with the standardized Instructional Assessment forms.
6. Discussions of student performance conducted by Graduate Committee members
7. Exit survey given to graduating majors—we recently implemented this to gain feedback on the Geology MS program also contact information and job placement data
8. Student placement in geoscience-related jobs or PhD programs
9. Communications with alumni and companies that employ our students re: what are we doing well and what learning outcomes could be improved or modified

Graduate faculty are encouraged to tabulate data acquired through these assessment methods, and use the results to improve aspects of their courses. Time permitting, the data is analyzed by department Assessment Coordinator. Each year the Geology Department submits an Assessment Report to the University. Discussions at faculty meetings continually aim to improve program instructional quality and relevance while addressing the changing needs of our discipline.

(e) Evaluate the procedures for collecting and analyzing evidence that program goals and objectives are being achieved.

E. Assessment Procedures and Timeline

Assessment of our Programmatic Learning Outcomes occurs as follows: We select two of the first four SLOs (#1-#4) each year. Graduate courses that address these outcomes (see matrix above) are analyzed. Assessment data pertaining to the outcomes are gathered by instructors as part of the normal evaluation process for the course. Instructors then make adjustments as needed to better meet the outcomes. The process is repeated the second year for the remaining two SLOs.

SLOs #5-#8 pertain directly to Masters' thesis research conducted by individual students. These outcomes are assessed each year by the Graduate Committee responsible for evaluating student performance. Assessment is accomplished through application of evaluation rubrics and frank discussions among committee members. Thus, all eight SLOs can be assessed in a 2 year time frame, with the process repeated and refined during the next cycle.

(f) Summarize the assessment performed in the last five years, conclusions from that assessment, and any changes to the program based on that assessment.

F. Assessment Results from Last Four Years

A formal assessment plan was not a required component of our original Master's proposal. However, by following the procedures outlined above we have learned much about our program and graduate student learning achievements, as well as detriments or hurdles affecting progress to degree. Probably the most important finding is the bottleneck created by the thesis requirement. This is discussed above in **Section 2H**, with some proposed solutions. Such bottlenecks are common in many graduate programs that require a written thesis.

Section 4 – Program Quality

Section 4.1 Faculty

This section should include both description and self-appraisal of the following:

(a) Assess the quality of teaching. This section must include the computer-generated discipline averages of course evaluations as well as a copy of the questionnaire and an evaluation of the results, with particular attention to the most important questions on the questionnaire. The section may also include other indicators such as distinguished teaching awards.

A. Quality of Teaching

The Geology Department conducts student evaluations for all 400 level undergraduate/graduate courses and laboratories. Numerical results are reported each quarter and summarized embodied in individual RTP evaluations of individual faculty members. Unfortunately student evaluations

are not allowed for our 500 and 600-level graduate courses because these are taught through College of Extended University and the contract does not permit student evaluations for self-support courses.

Below is a sample student evaluation form implemented in our GSC courses. Geology Graduate faculty generally record mean student evaluation scores between 1 and 2 on a scale of 1 to 5 (1 = Strongly Agree; 5 =Strongly Disagree). Commonly the mean faculty scores are between 1.0 and 1.5. These numerical results suggest high quality teaching in the graduate courses.

Table 4. Student Evaluation Questions For All GSC Courses							
Question #	Question Wording	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
1	Instructor presented class material in an organized manner						
2	Instructor explained concepts and work assignments clearly						
3	Instructor responded well to questions						
4	Exams and quizzes were representative of the subject matter presented						
5	Instructor provided useful feedback on student work						
6	Overall, the instructor was an effective teacher						
7	I gained meaningful geoscience knowledge and/or skills in this class						

It is also noteworthy that Dr. Jascha Polet received the College of Science Distinguished Teaching Award in 2014. Dr. Jon Nourse was selected for this award in 2001.

(b) Summarize faculty research and scholarly activity. Include in an appendix the resumes of the faculty or a list of research, scholarship and creative activity.

B. Faculty Research and Scholarly Activity

Since inception of the Geology MS program in 2012 the number of graduate faculty has grown from four to six. Drs. Nick Van Buer and Bryan Murray were hired in 2014 and 2015, respectively to replace two retiring FERP faculty. Below is a synopsis of faculty expertise:

Jonathan Nourse (BS in Geological Engineering, Colorado School of Mines, 1989; MS in Geology, Caltech, 1985; PhD in Geology Caltech, 1989). Web site:

<http://geology.cpp.edu/janourse/>

Biographical Sketch: Dr. Nourse holds a BS degree from Colorado School of Mines and MS and PhD degrees from Caltech. He has conducted geologic and hydrologic field research in the Mojave Desert, San Gabriel Mountains, and Sonora, Mexico since 1985. Nourse has taught full-time at California State Polytechnic University for 27 years. Since 1999 his expertise in field geology and tectonics has been applied to the search for structurally-controlled gold, silver, copper, and

molybdenum deposits within the Sonora mineral belt. As Director and Vice President of Exploration for Colibri Resource Corporation from 2006 to 2014, he contributed geological mapping and structural expertise to exploration of the San Francisco-Juarez gold property, the Leon porphyry molybdenum-copper property, and the Ramard silver-zinc scarn property (see www.colibriresourcecorp.com). Nourse has also written numerous articles and technical consulting reports about hydrology of the eastern San Gabriel Mountains area and the tectonics of Mojave Desert. He has supervised multiple undergraduate and Master's theses on related topics. Many of his consulting reports focused on enhancement of water supply to local Mt. Baldy residents. Noteworthy publications may be accessed through <http://geology.cpp.edu/janourse/ArticlesGuidesReports.htm>. Since 2009 Nourse has also served as Chair of the Cal Poly Pomona Geological Sciences Department.

Jeffrey Marshall (BA in Geological Sciences, UC Santa Barbara, 1984; MS in Earth sciences, UC Santa Cruz, 1991; PhD in Geosciences, Pennsylvania State University, 2000). Web site: <http://www.cpp.edu/~marshall/index.htm>

Biographical Sketch: Dr. Marshall studied geology and earth surface processes at UC Santa Barbara (BS), UC Santa Cruz (MS), and Penn State (PhD). He has been on the Geological Sciences faculty at Cal Poly Pomona since 2001, and is also an adjunct professor with the Lyle Center for Regenerative Studies. He is a geomorphologist with research and teaching expertise in neotectonics, geologic hazards, coastal processes, fluvial geomorphology, and watershed restoration. Much of his research has focused on the neotectonics and earthquake hazards of convergent plate margins, with multiple publications in peer-reviewed journals (see <http://www.cpp.edu/~marshall/manuscripts.htm>), and over 25 years of experience conducting field research in Central America, Mexico, and New Zealand (including his M.S. and Ph.D. research). His field expertise includes the study of megathrust fault tectonics, forearc deformation and seismic-cycle uplift, fault structure and kinematics, coastal geomorphology and sedimentology, marine and fluvial terraces, and Quaternary geochronology. He maintains long-standing research collaborations with many U.S. and international colleagues, including the Costa Rican Volcanologic and Seismologic Observatory (OVSICORI-UNA) and the New Zealand Geological Survey (GNS Science). For the past 15 years, Dr. Marshall has been involved in the research and education efforts of the National Science Foundation MARGINS and GeoPRISMS Programs including funded research in Costa Rica, serving on the GeoPRISMS Education Advisory Committee, and leading field trips, convening workshops, and directing student research symposia in Costa Rica, Nicaragua, New Zealand, and the U.S. He has substantial prior experience mentoring international undergraduate field research with both the Keck Geology Consortium and his own NSF MARGINS REU Program. He is a five-term Geosciences Councilor with the national Council on Undergraduate Research (CUR), former University Coordinator for Undergraduate Research, and founding chair of the Cal Poly Pomona Undergraduate Research Faculty Advisory Council (URFAC). Dr. Marshall is a campus representative on the California State University Council on Ocean Affairs, Science, and Technology (COAST) and a member of the Water Resources and Policy Initiative (WRPI).

Jascha Polet (BS in Geophysics, University of Utrecht, the Netherlands, 1988; MS in Geophysics, Caltech, 1994; PhD in Geophysics, Caltech, 1999). Web site:

<http://geology.cpp.edu/jpolet>

Biographical Sketch: Dr. Polet holds a BS degree in Geophysics from the University of Utrecht in the Netherlands and MS and PhD degrees in Geophysics from Caltech. After completing her PhD, she worked as a researcher at the Caltech Seismological Laboratory for five years, specializing in observational seismology and earthquake source processes. After three years as an Associate Researcher at the Institute for Crustal Studies at the University of California in Santa Barbara, she started as Assistant Professor of Geophysics at California State Polytechnic University in Pomona in 2007 and was recently promoted to Full Professor in 2014. In the last decade, her research has focused on near real-time determination of rupture models of large global earthquakes, in collaboration with researchers at the United States Geological Survey National Earthquake Information Center. A short list of publications may be found at: [http://geology.cpp.edu/jpolet/Jascha Polet at Cal Poly Pomona/Research.html](http://geology.cpp.edu/jpolet/Jascha_Polet_at_Cal_Poly_Pomona/Research.html). During this time, she has received substantial funding through grants and contracts from the National Science Foundation, The National Earthquake Hazard Reduction Program, JPL, Caltech, the Department of Education and the Southern California Earthquake Center. Dr. Jascha Polet is a member of the Advanced Rapid Imaging and Analysis (ARIA) group at Caltech and JPL, developing and implementing rapid finite fault inversions for large worldwide earthquakes using seismic and geodetic data. For the last 5 years, she has had a Visiting Associate position at Caltech. Dr. Polet has advised numerous graduate and undergraduate theses on a wide variety of topics in subsurface geophysics and seismology. Her undergraduate and graduate students have co-authored many tens of abstracts to national conferences in the last three years alone (abstracts are listed in annual reports at <http://www.cpp.edu/~sci/geological-sciences/about/academic-goals.shtml>).

Stephen Osborn (B.S. UC Riverside; M.S. UC Riverside; M.S. Georgia State University; PhD University of Arizona)

Biographical Sketch: Osborn is an environmental hydrogeologist whose research focuses on the elemental and isotope geochemistry of surface water and groundwater to understand the source of fluids, flow pathways, and biogeochemical processes. He also has expertise in natural gas geochemistry and water quality issues related to subsurface hydrocarbon migration and extraction. Osborn has conducted extensive field research for 10 years in Canada, New York, Pennsylvania, North Dakota, Montana, Colorado, and California investigating potential impacts from intensive oil and gas production. He has several highly cited peer reviewed papers published in the Proceedings of the National Academy of Science, Environmental Science and Technology, Hydrogeology Journal, Applied Geochemistry and the American Journal of Science. Between MS degrees, Stephen worked as a consultant for 6 years, conducting hydrogeologic and environmental investigations in the northeast and southwest US, which included phase I and II assessments, remedial feasibility testing, Environmental water well drilling, and aquifer testing. Osborn is also Adjunct faculty at the University of Colorado Boulder and research faculty in the California State University Water Resources and Policy Initiative. He has five years of teaching experience at Cal Poly Pomona and research faculty with the California State University Water Resources and Policy Initiative.

Nicholas Van Buer (BS in Geology, Caltech, 2005; PhD in Geology, Stanford, 2012). Web site: <http://www.cpp.edu/~njvanbuer>

Biographical Sketch: Dr. Van Buer holds a BS in Geology from Caltech and a PhD in Geology from Stanford University. After completing his PhD, Van Buer was a teaching assistant at Harvard, did postdoctoral work at MIT, and worked for a geotechnical startup in Irvine. He studies the mineralogy, structure, geochemistry, and radiometric ages of rocks, in the context of geologic mapping, to answer questions about the plate tectonic history of earth's continents. In the course of his research, Van Buer has produced geologic maps covering over 20,000 km² in Nevada, the Indian Himalaya, and southern California. A list of recent publications can be accessed at <http://www.cpp.edu/~njvanbuer/publications.html>. Van Buer started as an Assistant Professor at Cal Poly Pomona in Fall 2014 and has already mentored several student research projects on topics ranging from the economic geology of cement resources to the history of extinct super-volcanoes in southern California.

Bryan Murray (BS in Geology-Paleobiology, UCLA 2003; MS in Geology, UCLA, 2007; PhD in Geology, UC Santa Barbara, 2014).

Website: <http://geologistbryan.weebly.com/>

Biographical Sketch: Dr. Murray completed his PhD at UC Santa Barbara in 2014 and his MS from UCLA in 2007. He currently teach sedimentary geology, field methods, historical geology, and megascopic petrography courses. Murray is a "field geologist," with research primarily field-based, combining detailed geologic mapping, sedimentology, stratigraphy, physical volcanology, and structural geology with a variety of laboratory techniques including provenance analyses, petrography, geochemistry, and geochronology. His recent research projects focus on the relationship between extensional basin development and mid-Cenozoic ignimbrite flare-up magmatism in the Copper Canyon region of the Sierra Madre Occidental silicic large igneous province of northwestern Mexico and in the Mojave Desert of Southern California. His master's thesis addressed sedimentology, stratigraphy, and provenance of non-marine deposits in Bolivian Altiplano. Each of these studies involved collaborating with local in-country geologists and professors from several universities (see <http://geologistbryan.weebly.com/research.html>). Prior to his current position, Dr. Murray worked as an adjunct geology instructor at several community colleges in Southern California (Santa Monica College, Mt. San Antonio College, El Camino College, Pasadena City College, Antelope Valley College, Pierce College, and Los Angeles City College), teaching Introductory Geology, Historical Geology, Oceanography, and Earth Science. As a teaching assistant at UCLA and UCSB, he developed laboratories and taught lab sections for a wide range of geology courses including Dinosaurs, Physical Geology, Field Geology Methods, Sedimentary Petrology & Stratigraphy, History of Life, Historical Geology, Geological Catastrophes, and Oceanography.

We list the publications, grants, and other scholarly activities of Graduate Faculty in our **Geology Department Annual Reports** for 2012, 2013, 2014 and 2015, posted at <http://www.cpp.edu/~sci/geological-sciences/about/academic-goals.shtml>

(c) *Include a table describing the typical annual workload (not including summer) for each tenure track faculty member and full time lecturer. (See example below.)*

C. Annual Workload

Table 5 below summarizes the work efforts of Geology Graduate Faculty since inception of the graduate program in Fall 2012. Workload is measured in terms of Weighted Teaching Units (WTUs). A full-time workload is considered by the University to be 45 WTUs per year, including 9 WTUs arbitrarily designated for student advising and committee service. It is clear from this data that all Graduate faculty regularly exceed the 36 WTU/year minimum. Also noteworthy is the significant amount of time represented by external grant funding and reimbursed university work assignments. These reimbursed funds are used to augment our annual lecturer instructional budget. The column for CEU Buyout represents the 500 and 600-level graduate courses taught through College of Extended University that reimbursed in a manner similar to grants. The reviewer is referred to **Table 2** for specifics of which courses were taught by individual instructors.

Table 5. Geological Sciences Department Faculty Workload						
Faculty Member	Academic Year	State-Supported Teaching WTUs at Full Salary Rate	University Reassigned Time at \$1204 or \$1226/WTU	Grant Buyout at Full Salary Rate	CEU Buyout at Negotiated Rate	Total Annual WTUs
Marshall	2012-13	6.33	16	6	12.25	40.58
	2013-14	14.66	8	10	4.75	37.41
	2014-15	10.83	16	5	9.1	40.93
	2015-16	18	10	7	1	36
Murray	2015-16	18	18	0	0.5	36.5
Nourse	2012-13	13.34	22.5	1	9.75	46.59
	2013-14	15.34	22.5	4	19.25	61.09
	2014-15	19.16	22.5	1	15.1	57.76
	2015-16	10.33	30.5	1	3.5	45.33
Osborn	2012-13	13	4	7	15.25	39.25
	2013-14	21.33	0	7	19.75	48.08
	2014-15	22.49	0	7	16.1	45.59
	2015-16	23.5	2	5	15.5	46
Polet	2012-13	9.66	5	15	9.75	39.41
	2013-14	14	12	1	16.25	43.25
	2014-15	23.67	0	2	25.6	51.27
	2015-16	16	0	1	20	37
Van Buer	2014-15	23	12	0	1.1	36.1
	2015-16	19.17	12	2	7	40.17

(d) Summarize faculty participation in the department, university, profession and community. Include evidence of collegiality, interdisciplinary activities, committee involvement, and faculty development activities.

D. Geology Faculty Service Activities

Faculty service contributions to department, university, profession and community are too numerous to list efficiently. Reviewers are referred to our *Geology Department Annual Reports* for 2012, 2013, 2014 and 2015, posted at

<http://www.cpp.edu/~sci/geological-sciences/about/academic-goals.shtml>

(e) Describe the department involvement in civic engagement and other community outreach (not including service learning) and discuss any plans for increase or decrease in such activities.

E. Civic Engagement

Geology graduate faculty regularly present lectures to the local community and serve on various advisory boards. *Geology Department Annual Reports* for 2012, 2013, 2014 and 2015, posted at <http://www.cpp.edu/~sci/geological-sciences/about/academic-goals.shtml> provide lists of such activities between since Fall 2012.

(f) Describe the department involvement in service functions for other programs such as involvement in interdisciplinary, certificate, or credential programs for undergraduates. Discuss any plans for increase or decrease in such activities.

F. Service Courses

Geology graduate faculty teach several service courses for other programs. These include:

- GSC 415/L, Engineering Geology II, is a required course for the Civil Engineering Geotechnical MS program and a Restricted Elective for the Geology MS program. This course was taught Winter 2011, Winter 2013, and Winter 2015 with enrollments of about 36 students, evenly split between CE and Geology students.
- GSC 432/L, Soil Physics, is an elective course for College of Agriculture MS and a Restricted Elective for the Geology MS program. This course was taught Fall 2013 and Winter 2015.
- GSC 401/L, GIS Applications for Earth and Environmental Scientists I, is a core class for Geology BS majors and a restricted Elective for Geology MS students in addition to serving as an elective for the GIS Minor program. Taught once every 2 years, enrollments are dominated by Geology BS and MS students.
- GSC 411/L, GIS Applications for Earth and Environmental Scientists II, is a core class for Geology BS majors and a restricted Elective for Geology MS students in addition to serving as an elective for the GIS Minor program. Taught once every 2 years, enrollments are dominated by Geology BS and MS students.

Section 4.2 Student Success

- a) Describe the departmental advisement program and evidence of quality (for example, assessment plan of advising program, faculty involvement in special advising programs such as CARES or SEES, advising awards, and the student persistence rates provided by the Office of Institutional Research, Assessment and Planning.)*

A. Graduate Student Advisement Program

Advisement begins with direct consultation with the Graduate Coordinator during the application and admissions process. The coordinator ensures that all required paperwork is received. Upon matriculation, each student is advised about courses to enroll and provided guidance through the registration/fee payment process. Financial aid options are discussed, with GA and GTA awards arranged where appropriate.

Graduate faculty hold an Orientation event for the cohort of new students each September during the first meeting of the required GSC 501 (Current Topics) seminar. Continuing graduate students are invited to this early evening meeting where food is provided. The goals of our orientation session are to: **1)** summarize the MS curriculum requirements, **2)** walk students through the process of completing the Graduate Contract, **3)** outline the process and deadlines for completing the requirements for GSC 600 (Thesis Proposal) and GSC 696 (Master's Thesis), and **4)** emphasize the importance of maintaining a minimum GPA of 3.0.

All graduate students are expected to consult regularly with their chosen thesis supervisor to thesis research and related

- b) *Assess the learning environment. Include indicators such as special department events, department publications, and faculty involvement in student clubs or other extracurricular activities.*

B. Student Learning Environment

In addition to an environment of comradery developed during seminars and class field trips we have set up a large and comfortable work space in room 4-A-645 for graduate students to utilize at all hours. This multi-purpose graduate office contains several work tables and 6 computer work stations installed with state-of-the art software. GTAs hold office hours there, and graduate students assemble

Graduate students and graduate faculty are encouraged to attend all GSC 600 (Thesis Proposal) and GSC 696 (Master's Thesis defense) seminars. These are held near the end of each quarter. Food is provided and there is time to for faculty-student interaction and updates on important issues or deadlines. The seminars also serve to motivate students as they view their peers making professional presentations of thesis research.

- c) *Summarize and assess the steps taken to implement a First Year Experience Program.*

C. First Year Experience Program

N/A, such programs are for freshman undergraduate majors

- d) *Discuss student commitment, motivation and satisfaction. Include surveys of student opinions regarding the program outcomes and quality. This section also may include discussion of special student contributions to the work of the department.*

D. Student Commitment, Motivation, and Satisfaction

Graduate student morale is generally high. Because most of our students enter the program as a cohort during fall quarter and enroll in the same classes, a comradery develops along with a support system that is continually sustained as new students matriculate. Many continuing graduate students work on their thesis projects in the graduate work room of 4-A-645, providing motivation to newer students. There also exists a graduate student network that assists new students in finding affordable housing. We know of several groups of graduate students who share houses to reduce rental expenses

Many of our GA awards are designated for graduate student support of Department operations. GA awardees serve as drivers on department field trips and otherwise assist instructors with field trip logistics and deployment of technical equipment during laboratories. These duties are especially important given the large sizes (25-40 students) of our field and laboratory classes. Other GAs serve as graders for some of the larger undergraduate. All of these opportunities provide work experience and training to our graduate students that has been instrumental in their successful placement in PhD programs or industry positions.

- e) *Discuss co-curricular learning experiences that are relevant to the program goals (such as internships, research experiences, study abroad); include the number of students that participate in these experiences.*

E. Co-Curricular Learning Experiences

Field experiences:

Over 10 graduate students participated in two summer field experiences in Yellowstone National Park (2014, 2015), with partial financial support through a subcontract with PCC. Most GSC graduate courses have required field trips that provide further opportunities for cohorts of graduate students to bond.

Internships:

- Danny Miranda successfully competed for a Watershed Management Internship funded by USDA / Water Resources Policy Initiative (2014-15)
- Rachel Hatch was selected to participate in SIRI JPL research internship program (2014, 2015)
- Magali Barba was selected to participate in the DEVELOP National internship Program at Jet Propulsion Laboratory (2014)

Research experiences:

- Hannah Mejia, Terry Cheiffetz and Magali Barba were selected to sail on Cascadia Initiative (CI) Expedition, Summer 2014 and 2015
- Terry Cheiffetz was selected to sail on ENAM Community Seismic Experiment broadband Ocean Bottom Seismometer recovery cruise, Spring 2015

Workshops with financial support:

- Hannah Mejia participated in “Bringing New Tools and Techniques to Bear on Earthquake Hazard Analysis and Mitigation” Pan-American Advanced Studies Institute, with full financial support from organizers (2014)
- Magali Barba attended a workshop on InSAR: An Introduction to Processing and Applications using ROI Pac and GIAN-T Short Course in Boulder, Colorado with financial support from organizers (2014)
- Rachel Hatch attended the IRIS-EarthScope USArray Data Processing and Analysis Introductory Short Course in Evanston, Illinois with full financial support from organizers (Summer 2014)
- Magali Barba attended a workshop on “Active Deformation, Faults and Earthquakes from Measurements to Models” in Séolane, France with full financial support from organizers, Feb 2015
- Magali Barba participated in the 3rd international summer school on Earthquake Science in September 4-8, 2015 at Lake Yamanaka, Japan with full financial support from organizers
- Dandan Zhang participated in the fourth annual Seismology Student Workshop to be held March 17-18, 2016 at the Lamont-Doherty Earth Observatory in Palisades, New York, with full financial support from organizers

f) *A summary of the following data should also be included:*

- *Number of graduates employed in a field or job requiring the degree(s)*
- *Number in graduate schools*
- *Numbers taking and passing licensing exams*
- *Other accomplishments by current and former students that reflect on program quality.*

F. Graduate Placement

As shown below in **Table 6**, we have been very successful in placing our graduates. Six of our eleven Master’s degree recipients since June 2012 are gainfully employed in geoscience industries. Three additional graduates are pursuing PhDs at prestigious doctoral institutions. We have lost contact with only one graduate who is rumored to be working in the local geotechnical industry.

Table 6. Geology MS Program Enrolled Student Data 2012-2016

Graduated Students:								
Name	Gender	Ethnicity	Source Institution	Year of BS Degree	Quarter Matriculated	Thesis Advisor	Quarter Graduated	Placement
	M	Caucasian	CPP	2000	Fall 2012	Nourse	Spring 2014	Project Geologist, registered Professional Geologist, certified Engineering Geologist; TetraTech Corp., Diamond Bar, CA
	F	Hispanic	CPP	2012	Fall 2012	Polet	Summer 2014	PhD Candidate, Baylor University, Waco, TX
	F	Hispanic	CPP	2011	Fall 2012	Polet	Summer 2014	Staff Geologist, Geo-Logic Associates, Claremont, CA
	M	Caucasian	CPP	2012	Fall 2012	Osborn	Summer 2014	Staff Geologist, Stantec, Inc., Redlands, CA
	M	Caucasian	CPP	2010	Fall 2012	Nourse	Summer 2014	Senior Environmental Scientist, TRC Solutions, Inc., Los Angeles
	M	African American	CSU San Bernardino	2011?	2011?	Polet	Fall 2014	*MS degree awarded by CSUSB; Dr. Polet served as primary thesis advisor, now at Langan Engineering and Environmental Services
	F	Caucasian	CPP	1998	Fall 2012	Nourse	Winter 2015	Supervising Criminalist, Scientific Services Bureau, Los Angeles Sheriff's Department
	M	Caucasian	CPP	2011	Fall 2012	Marshall	Spring 2015	Geotechnical industry (?)
	F	Caucasian	CPP	2014	Spring 2014	Polet	Summer 2015	PhD Candidate, University of Nevada, Reno; Seismology program
	M	Asian	CPP	2013	Fall 2013	Polet	Summer 2015	Engineer Trainee at Waterland Group in Hong Kong
	M	Asian	UC Santa Barbara	2013	Fall 2013	Polet	Winter 2016	Teaching for LA Unified School District while applying for jobs in Petroleum industry
	F	Hispanic	UC Berkeley	2012	Winter 2013	Polet	Winter 2016	PhD Candidate, University of Colorado, Boulder; Remote Sensing program
Active Students:								
Name	Gender	Ethnicity	Source Institution	Year of BS Degree	Quarter Matriculated	Thesis Advisor	Anticipated Graduation	Type of Entering Student
	F	Caucasian	CSU San Bernardino	2006	Fall 2013	Nourse&Osborn	Spring 2016	Industry professional seeking MS degree for advancement
	M	Caucasian	CPP	2008	Fall 2012	Osborn	Spring 2016	Industry professional seeking MS degree for advancement; Transferred in several grad classes from UC Riverside
	F	Caucasian	UC Berkeley	2012	Fall 2013	Marshall	Spring 2016	Continuing student with limited resources
	M	Caucasian	CSU San Bernardino	2013	Fall 2013	Osborn	Spring 2016	Continuing student with limited resources
	M	Caucasian	CSU Northridge	2013	Fall 2013	Nourse	Spring 2016	Currently PhD candidate at University of Kentucky
	M	Asian	CPP	2013	Fall 2014	Polet	Fall 2016	Continuing student with limited resources
	M	Caucasian	Tulane University	2012	Fall 2014	Nourse	Fall 2016	Employment plateau; Seeking MS degree for career advancement
	M	Hispanic	UC Riverside	2013	Fall 2014	Nourse	Fall 2016	Continuing student with limited resources
	F	Hispanic	UC Berkeley	2013	Fall 2014	Polet	Fall 2016	Continuing student with limited resources
	M	Caucasian	UC Santa Barbara	2013	Fall 2014	Polet	Fall 2016	Continuing student with limited resources
	M	Caucasian	CSU San Bernardino	2013	Fall 2013	Osborn	Fall 2016	Continuing student with limited resources
	F	Hispanic	UCLA	2005	Spring 2013	Osborn	Fall 2016	Employment plateau; Seeking MS degree for career advancement
	M	Caucasian	CPP	2013	Spring 2013	Osborn / Nourse	Fall 2016	Continuing student with limited resources
	M	Caucasian	Northern Arizona University	2012	Winter 2014	Polet	Fall 2016	Continuing student with limited resources
	M	Caucasian	University of Arizona	2011	Fall 2014	Polet	Winter 2016	Employment plateau; Seeking MS degree for career advancement
	M	Hispanic	Franklin&Marshall	2013	Fall 2013	Nourse	Winter 2016	Continuing student with limited resources
	M	African American	CPP	2010	Fall 2013	Nourse		Continuing student with limited resources
	M	Asian	CPP	2013	Winter 2014	Polet		Continuing student with limited resources
	F	Asian	UC Berkeley	2013	Winter 2014	Polet		Continuing student with limited resources
	M	Caucasian	USC	2014	Winter 2015	Polet		Continuing student with limited resources
	F	Native American	USC		Spring 2016	Polet		Continuing student with limited resources
	M	Hispanic	CPP		Fall 2016	Polet		Continuing student with limited resources
	M	Caucasian	CPP		Fall 2016	Osborn		Continuing student with limited resources
	M	Caucasian	CSU Sacramento		Fall 2016	Osborn		Employment plateau; Seeking MS degree for career advancement
	M	Caucasian	Amherst College		Fall 2016	Van Buer		Employment plateau; Seeking MS degree for career advancement
	M	Caucasian	Brigham Young University		Fall 2016	Van Buer/Nourse		Continuing student with limited resources
	M	Caucasian	Georgia State University		Fall 2016	Osborn		Employment plateau; Seeking MS degree for career advancement
Inactive Students:								
Name	Gender	Ethnicity	Source Institution	Year of BS Degree	Quarter Matriculated	Thesis Advisor	Reason For Inactivity	
	F	Caucasian	CSU Fullerton	2014	Spring 2015	Van Buer	Financial and motivational difficulties	
	F	Caucasian	CPP	2013	Fall 2013	Undeclared	Financial and motivational difficulties; weak geoscience preparation	
	M	Caucasian	Acadia University, Maine	2013	Fall 2013	Undeclared	Difficulty adjusting to Southern California climate and culture	
	M	Asian	UC Irvine	2009	Fall 2012	Osborn	Financial and motivational difficulties	

- g) Discuss alumni opinions regarding the program and its quality. (The Office of Alumni Affairs should be asked for assistance in compiling names and addresses of alumni.) These may be based on survey results, interviews or opinions of graduates invited to campus to give their views on the program in small discussion groups or panels.

G. Alumni Feedback

Our graduate program is young, so we are just beginning to receive feedback from recent graduates. All has been positive and all of our graduates are gainfully employed.

Section 5 – Resources

- (a) Enrollment. Discuss five-year data supplied by the Office of Institutional Research, Assessment and Planning. The discussion should include trends in numbers and retention of students by gender and ethnicity, and should include comparisons, as relevant, to college, university, CSU, and national trends and needs.

A. Enrollment

Demand for the Geology MS program over the past 4 years is measured by applicant, admissions, and show rate data in **Table 7**. We summarize additional information on gender, ethnicity, student retention, graduation rate, and placement of graduates in **Table 6**. The evaluator is referred to **Table 2** in **Section 2I** for enrollments in specific graduate courses.

Term	Inquiries & Followup	Number of Applicants	CPP Geology Major or Alumnus	Other California Applicants	Out-of-State or International Applicants	Admitted	Matriculated
Fall 2012		14	11	2	1	13	9
Winter 2013		3	0	2	1	2	1
Spring 2013		5	1	2	2	2	2
2012-13 Totals	30	22	12	6	4	17	12
Fall 2013		19	6	11	2	18	11
Winter 2014		7	1	3	3	3	3
Spring 2014		2	1	0	1	1	1
2013-14 Totals	40	28	8	14	6	22	15
Fall 2014		12	1	7	4	11	7
Winter 2015		2	1	1	0	1	1
Spring 2015		3	1	2	0	2	2
2014-15 Totals	45	17	3	10	4	14	10
Fall 2015		12	2	4	6	12	6
Winter 2016		0	0	0	0	0	0
Spring 2016		2	2	0	0	2	2
2015-16 Totals	35	14	4	4	6	14	8
*Fall 2016	27	15	7	5	3	12	

* Incomplete data. Applications are being accepted through June 2016

The size of our graduate program (approximately 30 active students in a given year) is in the middle compared to other Cal Poly Pomona graduate programs. Accurate enrollment data from other Geology CSU graduate programs is difficult to acquire. However, informal discussions with other Geology Chairs in the CSU system reveal that our graduate program is relatively large, especially given the small size of our full-time faculty cohort.

(b) *Describe the department's involvement in student outreach and recruitment. Explain any steps to encourage transfer students to enter the program or to assist transfer students to make a smooth transition.*

B. Student Outreach and Recruitment

Our primary recruitment tool is the Geology Master's program web page that yields many inquiries. <http://www.cpp.edu/~sci/geological-sciences/masters-program/index.shtml>

Inquiries to the Graduate Coordinator are promptly responded to or directed to an appropriate graduate faculty member. We request that copies of application materials be sent directly to the department for prompt review. Qualified candidates are invited to campus for personalized tours of the department facilities, and lunch with available graduate faculty. We have also been very successful in recruiting graduate students from our existing pool of BS majors (**Table 7**).

(c) *Faculty. Discuss the use of faculty resources, retirement projections, plans for hiring new faculty, and trends in numbers of faculty by gender and ethnicity. The discussion should include comparisons, as relevant, to college, university, CSU, and national trends and needs.*

C. Faculty Resources

The Geology Graduate Faculty pool consists of six full-time tenure track faculty members and one full-time Lecturer. Specialties of individual faculty expertise are summarized in **Section 4.1B** and detailed on our web site: <http://www.cpp.edu/~sci/geological-sciences/faculty-and-staff/index.shtml>. Our full-time adjunct instructor (Ernest Roumelis) provides expertise in Engineering Geology. An active member of the Association of Engineering Geologists, Roumelis teaches our advanced Engineering Geology course (GSC 415/L) that also serves students from the Civil Engineering Department's Geotechnical Engineering MS program.

No retirements are anticipated in the near future. The Geology Department has a hiring plan that integrates with the University's ongoing initiative for "cluster hires" in strategic interdisciplinary areas. We are proposing two additional tenure-line faculty positions in areas of **Earth System Science/Global Environmental Change** and **Remote Sensing / Natural Hazards Assessment / GIS**". Such hires are badly needed to better accomplish MS thesis supervision of a growing number of graduate students and to accommodate the recent accelerated growth in our undergraduate programs. The number of Geology BS majors has increased from 35 in 2007 to 140 in 2016; Geology Minors have increased from 6 to ~25-30. Our current Student to Tenure-Track Faculty ratio is quite high in comparison to most other CSU Geology programs.

(d) *Library Resources. Discuss data supplied by the University Library.*

D. Library Resources

Please refer to <http://www.cpp.edu/~library/books-articles/index.shtml> for details on geoscience books and journals housed in the University Library. Articles from most other pertinent journals or graduate theses may be accessed free of charge through Interlibrary Loan.

This section should include both a description and self-appraisal of the following:

E. Staff

To support efforts of the Department Chair, faculty and students, the Geology Department has a full-time Administrative Support Coordinator, a half-time Administrative Support Assistant, and a Full-time Equipment Technician II <http://www.cpp.edu/~sci/geological-sciences/faculty-and-staff/staff.shtml> . These staff members are adequate to cover the needs of the Graduate program for the near future.

F. Operating Budget

The operating budget is the most problematic and contentious issue of our Geology Master's program. Most of the difficulties stem from our former Provost's requirement that the program be started up under a self-support budget model. As mentioned in **Section 1**, the graduate program operated with a significant deficit during its first three years. To balance the budget during this current year (2015-16), the Geology Department was given two choices: 1) double the student tuition rate from \$300/unit to \$600/unit, or 2) decrease average faculty compensation substantially.

An additional fiscal complexity is that the MS program actually operates on a hybrid budget model. Because the 400-level courses that compose 1/3 of our graduate curriculum are also enrolled by senior-level Geology BS majors, these must be run as state-support classes. Our 500 and 600-level GSC courses are offered through the College of Extended University (CEU) as self-support classes. This means that each graduate student must navigate through two different fee structures and two different enrollment systems during each quarter of residence. The logistics of managing this hybrid program are cumbersome for both the student and the Geology Graduate Coordinator (who must explain the details and continually clear up miscommunications between CEU and the Registrar's Office and University Accounting). In multiple cases students were double billed for auxiliary fees (student center, health center, etc.), with corrections very slow in processing.

Table 8 below details the instructional budget for the College of Extended University self-support portion of our hybrid Geology Master's program during its **first three years**. In addition to the deficits, Geology faculty continue to be concerned about the large proportion (35%) of the tuition revenue that goes to CEU overhead and other indirect costs. Actual services rendered by CEU are limited to scheduling the GSC courses in PeopleSoft, posting the schedule on their website, and monitoring the accounting. The Blackboard service fee charged by CEU is actually accomplished by Cal Poly Pomona University as part of their normal state-side operations. During the 2012-15 academic years, approximately \$100,000 of the total deficit of \$186,250 was absorbed by the College of Science Dean's office, despite a signed "Memo of Understanding" that stipulated all deficits would be covered by CEU during this time period.

Table 8. Cal Poly Pomona Geology MS Self-Support Program-- Budget details for first three years (2012-15)

CEU Course and Instructor		Revenue		Direct Program Expenses							Indirect Program Expenses								
Academic Year	Course Number	Student Units	Instructor	# of students enrolled	Tuition Revenue @ \$300/unit	Instructor Compensation Rate per WTU	WTUs paid to Instructor(s)	Instructor Compensation	Benefits: varies from 29% to 50% of Instructor Compensation, Depending on Instructor	Worker's Compensation: 2.95% of Instructor Compensation	Total Direct Costs	CEU Administrative and Institutional Fee (24% of Tuition Revenue)	Blackboard Hosting Fee: (5% of revenue)	Chancellor's Office & Campus Service Fee (5.83% of Tuition Revenue)	Total Indirect Costs	Total Costs	Balance		
2012-13	GSC 501	3	Nourse, Osborn, Marshall, Polet	9	\$8,100	\$1,706	3	\$5,118	\$2,009	\$151	\$7,278	\$1,944	\$405	\$472	\$2,821	\$10,099	-\$1,999		
2012-13	GSC 503L	2	Nourse	9	\$5,400	\$2,104	4	\$8,416	\$3,451	\$248	\$12,115	\$1,296	\$270	\$315	\$1,881	\$13,996	-\$8,596		
2012-13	GSC 545/L	4	Osborn	8	\$9,600	\$1,500	5	\$7,500	\$2,775	\$221	\$10,496	\$2,304	\$480	\$560	\$3,344	\$13,840	-\$4,240		
2012-13	GSC 534/L	4	Marshall	9	\$10,800	\$1,706	5	\$8,528	\$4,264	\$252	\$13,044	\$2,592	\$540	\$630	\$3,762	\$16,806	-\$6,006		
2012-13	GSC 564/L	4	Polet	10	\$12,000	\$1,511	1	\$7,556	\$2,191	\$223	\$9,970	\$2,880	\$600	\$700	\$4,180	\$14,150	-\$2,150		
2012-13	GSC 600	1	Nourse	3	\$900	\$2,104	1.5	\$1,156	\$1,294	\$93	\$4,543	\$216	\$45	\$52	\$313	\$4,857	-\$3,957		
2012-13	GSC 600	1	Osborn	2	\$600	\$1,500	1	\$1,500	\$555	\$44	\$2,099	\$144	\$30	\$35	\$209	\$2,308	-\$1,708		
2012-13	GSC 600	1	Marshall	2	\$600	\$1,706	1	\$1,706	\$853	\$50	\$2,609	\$144	\$30	\$35	\$209	\$2,818	-\$2,218		
2012-13	GSC 600	1	Polet	3	\$900	\$1,511	1.5	\$2,267	\$657	\$67	\$2,991	\$216	\$45	\$52	\$313	\$3,309	-\$2,409		
2012-13	GSC 694	1	Nourse	5	\$1,500	\$2,104	2.5	\$2,260	\$2,617	\$155	\$7,592	\$360	\$75	\$87	\$522	\$8,064	-\$6,564		
2012-13	GSC 694	1	Osborn	6	\$1,800	\$1,500	3	\$4,500	\$1,685	\$133	\$6,298	\$432	\$90	\$105	\$227	\$6,525	-\$5,125		
2012-13	GSC 694	1	Marshall	1	\$300	\$1,706	0.5	\$853	\$426	\$25	\$1,304	\$72	\$15	\$17	\$104	\$1,409	-\$1,109		
2012-13	GSC 694	1	Polet	4	\$1,200	\$1,511	2	\$3,022	\$876	\$89	\$3,988	\$288	\$60	\$70	\$418	\$4,406	-\$3,206		
2012-13 Totals					\$53,700		35	\$59,382	\$23,173	\$1,752	\$84,307	\$12,888	\$2,685	\$3,131	\$18,704	\$103,010	-\$49,310		
Academic Year	Course Number	Student Units	Instructor	# of students enrolled	Tuition Revenue @ \$300/unit	Instructor Compensation Rate per WTU (Includes 1.36% GSI)	WTUs paid to Instructor(s)	Instructor Compensation	Benefits: varies from 31% to 54% of Instructor Compensation, depending on Instructor	Benefits Savings from courses taught by full-time faculty as adjuncts	Worker's Compensation: 2.95% of Instructor Compensation	Total Direct Costs	CEU Administrative and Institutional Fee (24% of Tuition Revenue)	Blackboard Hosting Fee: (5% of revenue)	Chancellor's Office & Campus Service Fee (5.83% of Tuition Revenue)	Total Indirect Costs	Total Costs	Balance	
2013-14	GSC 501	3	Nourse, Polet, Osborn, Marshall	12	\$10,800	\$1,738	3	\$5,214	\$2,216	\$0	\$154	\$7,584	\$2,592	\$540	\$630	\$3,762	\$11,346	-\$546	
2013-14	GSC 503L	2	Nourse	14	\$8,400	\$2,125	4	\$8,500	\$3,726	\$0	\$251	\$12,477	\$2,016	\$420	\$490	\$2,926	\$15,403	-\$7,003	
2013-14	GSC 551	3	Klonsky	19	\$17,100	\$1,650	3	\$3,150	\$0	\$0	\$93	\$3,243	\$4,104	\$855	\$997	\$5,956	\$9,199	\$7,901	
2013-14	GSC 551L	1	Klonsky/Berry	19	\$5,700	\$1,680	7	\$2,100	\$0	\$0	\$89	\$2,189	\$285	\$332	\$385	\$460	\$1,262	\$3,451	\$1,553
2013-14	GSC 568/L	4	Polet	12	\$14,400	\$1,533	5	\$7,665	\$2,431	\$0	\$226	\$10,322	\$3,456	\$720	\$840	\$5,016	\$15,338	-\$938	
2013-14	GSC 545/L	4	Osborn	16	\$19,200	\$1,521	5	\$7,605	\$3,063	\$0	\$224	\$10,883	\$4,608	\$960	\$1,119	\$6,687	\$17,570	\$1,630	
2013-14	GSC 600	1	Nourse	5	\$1,500	\$2,125	2.5	\$5,313	\$2,329	-\$2,320	\$157	\$5,478	\$360	\$75	\$87	\$522	\$6,001	-\$4,501	
2013-14	GSC 600	1	Osborn	3	\$900	\$1,521	2.5	\$3,803	\$1,527	-\$301	\$112	\$5,140	\$216	\$45	\$52	\$313	\$5,454	-\$4,554	
2013-14	GSC 600	1	Marshall	1	\$300	\$1,772	0.5	\$886	\$481	\$0	\$26	\$1,394	\$72	\$15	\$17	\$104	\$1,498	-\$1,198	
2013-14	GSC 600	1	Polet	3	\$900	\$1,533	1.5	\$2,300	\$729	-\$739	\$68	\$2,368	\$216	\$45	\$52	\$313	\$2,681	-\$1,781	
2013-14	GSC 694	1	Nourse	18	\$5,400	\$2,125	9	\$19,125	\$8,384	-\$6,043	\$564	\$22,031	\$1,296	\$270	\$315	\$1,881	\$23,911	-\$18,511	
2013-14	GSC 694	1	Osborn	7	\$2,100	\$1,521	3	\$4,563	\$1,832	\$0	\$135	\$6,330	\$504	\$105	\$122	\$731	\$7,061	-\$5,161	
2013-14	GSC 694	1	Marshall	4	\$1,200	\$1,772	2	\$3,544	\$1,926	\$0	\$105	\$5,574	\$288	\$60	\$70	\$418	\$5,992	-\$4,792	
2013-14	GSC 694	1	Polet	12	\$3,600	\$1,533	6	\$9,198	\$2,918	-\$1,678	\$271	\$10,709	\$864	\$180	\$210	\$1,254	\$11,963	-\$8,363	
2013-14	GSC 696	3	Nourse	6	\$5,400	\$2,125	3	\$6,375	\$2,795	\$0	\$188	\$9,368	\$1,296	\$270	\$315	\$1,881	\$11,209	-\$5,839	
2013-14	GSC 696	3	Osborn	3	\$2,700	\$1,521	1.5	\$2,282	\$916	\$0	\$67	\$3,265	\$648	\$135	\$157	\$940	\$4,205	-\$1,505	
2013-14	GSC 696	3	Marshall	3	\$2,700	\$1,772	1.5	\$2,658	\$1,444	\$0	\$78	\$4,181	\$648	\$135	\$157	\$940	\$5,121	-\$2,421	
2013-14	GSC 696	3	Polet	6	\$5,400	\$1,533	3	\$4,599	\$1,459	\$0	\$136	\$6,193	\$1,296	\$270	\$315	\$1,881	\$8,074	-\$2,674	
2013-14 Totals					\$107,700		58	\$98,878	\$38,168	-\$11,071	\$2,917	\$128,892	\$25,848	\$5,385	\$6,279	\$37,512	\$166,404	-\$58,704	
Academic Year	Course Number	Student Units	Instructor	# of students enrolled	Tuition Revenue @ \$300/unit	Instructor Compensation Rate per WTU (Includes 1.6% GSI and promotions for Polet and Osborn)	WTUs paid to Instructor(s)	Instructor Compensation	Benefits: varies from 34% to 58% of Instructor Compensation, depending on Instructor	Benefits Savings from courses taught by full-time faculty as adjuncts	Worker's Compensation: 2.95% of Instructor Compensation	Total Direct Costs	CEU Administrative and Institutional Fee (24% of Tuition Revenue)	Blackboard Hosting Fee: (5% of revenue)	Chancellor's Office & Campus Service Fee (5.83% of Tuition Revenue)	Total Indirect Costs	Total Costs	Balance	
2014-15	GSC 501	3	Nourse, Polet, Osborn, Marshall, Van Buer	13	\$11,700	\$1,742	3	\$5,226	\$2,252	\$0	\$154	\$7,632	\$2,808	\$585	\$682	\$4,075.11	\$11,707	-\$7	
2014-15	GSC 503L	2	Nourse	11	\$6,600	\$2,125	4	\$8,500	\$4,127	\$0	\$251	\$12,878	\$1,584	\$330	\$385	\$2,298.78	\$15,176	-\$8,576	
2014-15	GSC 575/L	4	Osborn	16	\$19,200	\$1,635	5	\$8,177	\$3,356	\$0	\$241	\$11,975	\$4,608	\$980	\$1,119	\$6,687.36	\$18,662	\$5,348	
2014-15	GSC 524/L	4	Marshall	10	\$12,000	\$1,800	5	\$9,000	\$5,200	\$0	\$366	\$14,506	\$2,880	\$700	\$810	\$4,170.60	\$18,666	-\$6,666	
2014-15	GSC 564/L	4	Polet	12	\$14,400	\$1,713	5	\$8,564	\$3,011	\$0	\$253	\$11,828	\$3,456	\$720	\$840	\$5,015.52	\$16,844	-\$2,444	
2014-15	GSC 600	1	Nourse	2	\$600	\$2,159	1	\$2,159	\$1,048	\$64	\$64	\$2,223	\$144	\$30	\$35	\$208.98	\$2,432	-\$1,832	
2014-15	GSC 600	1	Osborn	4	\$1,200	\$1,662	2	\$3,323	\$1,445	\$0	\$98	\$4,867	\$288	\$60	\$70	\$417.96	\$5,285	-\$4,085	
2014-15	GSC 600	1	Marshall	0	\$0	\$1,800	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
2014-15	GSC 600	1	Polet	6	\$1,800	\$1,713	3	\$5,139	\$1,807	\$0	\$152	\$7,097	\$432	\$90	\$105	\$262.94	\$7,724	-\$5,924	
2014-15	GSC 600	1	Van Buer	1	\$300	\$1,517	0.5	\$758	\$259	-\$259	\$22	\$781	\$72	\$15	\$17	\$104.49	\$885	-\$585	
2014-15	GSC 694	1	Nourse	13	\$3,900	\$2,159	6.5	\$14,036	\$6,814	-\$6,814	\$414	\$14,450	\$936	\$195	\$227	\$1,358.37	\$15,808	-\$11,908	
2014-15	GSC 694	1	Osborn	10	\$3,000	\$1,662	5	\$8,308	\$3,613	-\$3,613	\$150	\$8,554	\$720	\$150	\$175	\$1,044.90	\$9,599	-\$6,599	
2014-15	GSC 694	1	Marshall	4	\$1,200	\$1,800	2	\$3,600	\$2,096	-\$2,096	\$106	\$3,706	\$288	\$60	\$70	\$417.96	\$4,124	-\$2,924	
2014-15	GSC 694	1	Polet	25	\$7,500	\$1,713	12.5	\$21,411	\$7,528	-\$6,624	\$632	\$22,466	\$1,800	\$437	\$2,612.25	\$25,558	-\$18,058		
2014-15	GSC 696	3	Nourse	6	\$5,400	\$2,169	3	\$6,478	\$3,145	-\$3,145	\$191	\$6,669	\$1,296	\$270	\$315	\$1,880.82	\$8,560	-\$3,160	
2014-15	GSC 696	3	Osborn	0	\$0	\$1,662	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
2014-15	GSC 696	3	Marshall	3	\$2,700	\$1,800	1.5	\$2,700	\$1,572	-\$1,572	\$80	\$2,780	\$648	\$135	\$157	\$940.41	\$3,720	-\$1,020	
2014-15	GSC 696	3	Polet	9	\$8,100	\$1,713	4.5	\$7,708	\$2,710	\$0	\$227	\$10,645	\$1,944	\$405	\$472	\$2,821.23	\$13,466	-\$5,366	
2014-15	GSC 699	1	Nourse and Marshall	3	\$900	\$0	0	\$0	\$0	\$0	\$0	\$0	\$216	\$45	\$52	\$313.47	\$313	\$587	
2014-15 Totals					\$100,500		63.5	\$115,088	\$50,224	-\$25,171	\$3,395	\$143,536	\$24,120	\$5,025	\$5,859	\$35,004	\$178,540	-\$78,040	

Table 9 shows a different approach to the self-support budget model for the current (2015-16) academic year. To reduce the deficits, instructor compensation is decreased to the minimum allowable rate that ranges from \$1144 to \$1226 per Weighted Teaching Unit (WTU). Also, some of the supervisory courses are taught as overload through adjunct contracts issued to specific faculty members at a rate of \$300/WTU. The cost of these contracts to the graduate program is also lower because fringe benefits are not charged. Meanwhile, indirect costs remain unchanged at 35% of the tuition revenue. The projected deficit for 2015-16 is lower but still significant (\$29,135).

Table 9. Geology MS Budget Model 2015-16 Academic Year
(Salaries Reduced to Minimum Allowable Level)

Academic Year	Course Number	Student Units	Instructor	# of students enrolled	Tuition Revenue @ \$300/unit	Minimum Allowable Instructor Compensation Rate per WTU	WTUs paid to Instructor(s)	Instructor Compensation	Benefits: varies from 36% to 65% of Instructor Compensation, Depending on Instructor	Backboard Hosting Fee: (5% of tuition revenue--88 generally not used)	Total Direct Costs	CEU Administrative and Institutional Fee (2% of Tuition Revenue)	Chancellor's Office & Campus Service Fee (5.37% of Tuition Revenue)	Liability Insurance: (2.81% of instructor compensation)	Total Indirect Costs	Total Costs	Balance
2015-16	GSC 501	3	Nourse, Picket, Osborn, Marshall, Van Buer, Murray	8	\$7,200	\$1,199	3	\$3,597	\$1,841	\$0	\$5,438	\$1,278	\$387	\$101	\$2,216	\$7,653	-\$453
2015-16	GSC 503L	2	Van Buer	7	\$4,200	\$1,144	4	\$4,576	\$2,698	\$0	\$7,184	\$1,008	\$216	\$129	\$1,862	\$8,546	-\$4,346
2015-16	GSC 599	2	Osborn	9	\$5,400	\$1,226	2	\$2,452	\$1,080	\$0	\$3,532	\$1,296	\$290	\$69	\$1,653	\$5,187	\$213
2015-16	GSC 599	2	Van Buer	9	\$5,400	\$1,144	2	\$2,288	\$1,304	\$0	\$3,592	\$1,296	\$290	\$64	\$1,650	\$5,242	\$158
2015-16	GSC 600S F	1	Nourse	2	\$600	\$1,226	1	\$1,226	\$602	\$0	\$1,828	\$144	\$32	\$34	\$2,039	\$5,209	-\$1,439
2015-16	GSC 600S F	1	Osborn	7	\$2,100	\$1,226	3.5	\$4,291	\$1,890	\$0	\$6,181	\$113	\$113	\$121	\$737	\$6,919	-\$4,819
2015-16	GSC 600S F	1	Marshall	1	\$300	\$1,226	0.5	\$346	\$346	\$0	\$513	\$72	\$16	\$17	\$1,051	\$1,064	-\$764
2015-16	GSC 600S F	1	Picket	13	\$3,900	\$1,226	6.5	\$7,969	\$2,834	\$0	\$10,803	\$536	\$209	\$224	\$1,369	\$12,172	-\$8,272
2015-16	GSC 600S F + F	1	Van Buer	0	\$0	\$1,144	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2015-16	GSC 699 Su + F	1	Picket and Nourse	5	\$1,500	\$0	0	\$0	\$0	\$0	\$0	\$380	\$81	\$79	\$441	\$441	\$1,059
Fall Totals					\$30,600		22.5	\$27,012	\$12,905	\$0	\$39,517	\$7,344	\$1,643	\$759	\$9,746	\$49,264	-\$18,664
2015-16	GSC 546/L	4	Picket	11	\$13,200	\$1,226	5	\$6,130	\$2,180	\$0	\$8,310	\$3,168	\$709	\$172	\$4,049	\$13,359	\$841
2015-16	GSC 600S W	1	Picket	16	\$4,800	\$1,226	8	\$9,808	\$3,488	\$0	\$13,296	\$1,152	\$258	\$276	\$1,685	\$14,981	-\$10,181
2015-16	GSC 600S W/no benefits	1	Nourse	2	\$600	\$300	1	\$300	\$0	\$0	\$300	\$144	\$32	\$8	\$185	\$485	\$115
2015-16	GSC 600S W/no benefits	1	Osborn	7	\$2,100	\$300	3.5	\$1,050	\$0	\$0	\$1,050	\$504	\$113	\$30	\$646	\$1,696	-\$404
2015-16	GSC 600S W/no benefits	0	Marshall	0	\$0	\$300	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2015-16	GSC 600S W/no benefits	1	Van Buer	1	\$300	\$300	0.5	\$150	\$0	\$0	\$150	\$72	\$16	\$4	\$92	\$242	\$58
2015-16	GSC 600S W/no benefits	0	Murray	0	\$0	\$300	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2015-16	GSC 699 W	1	Picket and Marshall	2	\$600	\$0	0	\$0	\$0	\$0	\$0	\$144	\$32	\$0	\$176	\$176	\$424
Winter Totals					\$21,600		18	\$17,438	\$6,688	\$0	\$23,106	\$5,184	\$1,160	\$890	\$6,834	\$29,939	-\$8,139
2015-16	GSC 546/L	4	Osborn	13	\$15,600	\$1,226	5	\$6,130	\$2,700	\$0	\$8,830	\$3,744	\$888	\$172	\$4,754	\$13,584	\$2,016
2015-16	GSC 600S Sp	1	Picket	7	\$2,100	\$1,226	4	\$4,904	\$1,744	\$0	\$6,648	\$504	\$113	\$75	\$740	\$7,402	-\$5,302
2015-16	GSC 600S Sp/No benefits	1	Nourse	2	\$600	\$300	1	\$300	\$0	\$0	\$300	\$144	\$32	\$8	\$185	\$485	\$115
2015-16	GSC 600S Sp/No benefits	1	Osborn	5	\$1,500	\$300	2.5	\$750	\$0	\$0	\$750	\$380	\$81	\$21	\$462	\$1,212	\$388
2015-16	GSC 600S Sp/No benefits	0	Marshall	0	\$0	\$300	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2015-16	GSC 600S Sp/No benefits	1	Van Buer	2	\$600	\$300	1	\$300	\$0	\$0	\$300	\$144	\$32	\$8	\$185	\$485	\$115
2015-16	GSC 600S Sp/No benefits	0	Murray	0	\$0	\$300	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2015-16	GSC 699 Sp	1	Osborn, Marshall	3	\$900	\$0	0	\$0	\$0	\$0	\$0	\$216	\$48	\$38	\$264	\$264	\$636
Spring Totals					\$21,300		13.5	\$12,384	\$4,444	\$0	\$16,828	\$5,112	\$1,144	\$348	\$6,604	\$23,432	-\$2,132
2015-16																	
2015-16																	
Academic Year Totals					\$73,500			\$56,834	\$22,617	\$0	\$79,451	\$17,640	\$3,947	\$1,597	\$23,184	\$102,635	-\$29,135

The self-support portion of our hybrid MS program operates under an ill-conceived and economically unsound budget model. Meanwhile the state-support portion, funded the same as all other College of Science graduate programs, is fiscally robust. Average enrollment in our 400-level graduate courses (**Table 2—40 classes**) is **24.4**. This number exceeds the Student Faculty Ratio (SFR) of **23.2 to 22.1** that controlled the level of instructional funding in our state-support budget between 2012 and 2015. Below in **Section 6 (*Suggestions For Action*)** we describe a proactive approach to restore the fiscal health of the graduate program. We propose to move the Master's program back to a fully state-supported budget model in concert with offering a blended 5-year BS-MS degree program. This plan will yield a self-sustaining graduate program with enrollments fueled by a continuous stream of highly-motivated undergraduate students from our burgeoning Geology BS program. Additional benefits to a blended program are increased enrollment in 500-level classes, as well as a reduced time to degree for undergraduate and graduate students.

F. Space and Facilities

A summary of Geology Department space and facilities is posted at:

<http://www.cpp.edu/~sci/geological-sciences/about/facilities-and-equipment.shtml>

In addition to a standard spectrum of geological mapping and sample preparation equipment (Brunton compasses, laser rangefinders, GPS receivers, I-pads, digital cameras, jaw crushers, shatter box, sieve shaker), the Department possesses a wide variety of equipment to facilitate Earth exploration and sampling endeavors: 6-passenger Ford F-250 pickup with camper shell, 12-passenger Ford van, two Nikon Total Stations for precise surveying, separate Philips X-ray diffraction and X-ray fluorescence instrumentation with upgraded software, Franz magnetic separator, 15 petrographic microscopes, fluid inclusion heating/freezing stage, Seistronix 24-channel seismic refraction instrument with 3-dimensional mapping software, GSSI ground-penetrating radar with two antennas capable of imaging to depths of 10 meters, La Coste-Romberg gravity meter, Gem Systems magnetometer, eleven field-deployable digital seismometers, two Syscal electrical resistivity systems, a hydrogeochemical laboratory with Dionex Ion chromatograph, Milli-Q ultra water purifier, water sampling equipment and water quality meters, and six digital velocity flow probes. Student computing facilities include a 14-station undergraduate computer lab with large format printer, and a graduate student work space with 6 computer work stations loaded with various seismological and geophysical processing, interpretation and modeling software and ArcGIS version 10.3 mapping software. Mineral and rock specimen collections include a comprehensive suite of thin sections and polished sections from classic localities. New purchases for 2014-16 include a Gemini gravity separation shaker table, Bico disc mill, new rock saw, 3 magnetic susceptibility meters, a dense-liquid mineral separation apparatus, and a new Nikon petrographic microscope with an automated point counter.

G. Computing Resources

(see Part 5F above—Our undergraduate computer lab has 14 work stations; the graduate student work room contains 6 work stations purchased during the past 3 years)

H. Fellowships, Brochures, Websites, Other Efforts to Support Recruitment and Retention

MENTORES/PPOHA Fellowships and Stipends

Several Geology graduate students have received financial awards from the **PPOHA (Promoting Postbaccalaureate Opportunities for Hispanic Americans)** program to provide direct support and offset expense of graduate education. Stipends for several others are pending:

- Danny Miranda: \$3000 fellowship for Spring-Summer 2015
- Tamara Yerkes: \$3000 fellowship for Spring-Summer 2015
- Julie Leiva: \$3000 fellowship for Spring-Summer 2015
- Mikey Herman: \$7500 fellowship for Spring 2015-16 academic year

Other Scholarship Awards:

- Julie Leiva: \$3000 COAST Graduate Student Research Award (2016)
- Kevin Chantrapornlert: \$450 from CPP Presidential Travel Fund to present at 2015 SEG/AAPG conference
- Raymond Ng: \$450 from CPP Presidential Travel Fund to present at 2015 Fall AGU conference

Graduate Teaching Assistantships (GTAs):

Since Fall 2012, the Geology Department has supported many of its graduate students through GTAs. These highly selective awards provide valuable teaching experience to our best and brightest graduate students. They carry the same obligations and responsibilities as Lectureships awarded to part-time instructors. GTA awards from 2012-16 are summarized below in **Table 10**:

Table 10. Geology Graduate Teaching Associates (GTAs): 2012-16					
Term	Student	GTA Award	Course Number	Course Name	WTUs
Fall 2012		\$4,107	GSC 255L	Field Methods	4
		\$1,800	GSC 151L	Earth, Time, and Life Lab	2
		\$1,800	GSC 141L	Principles of Geology Lab	2
Winter 2013		\$1,800	GSC 151L	Earth, Time, and Life Lab	2
		\$1,800	GSC 325L	Optical Mineralogy Lab	2
		\$1,800	GSC 141L	Principles of Geology Lab	2
Spring 2013		\$1,800	GSC 141L	Principles of Geology Lab	2
2012-13 Totals		\$14,907			16
Fall 2013		\$4,107	GSC 255L	Field Methods	4
		\$4,500	GSC 151L; GSC 350	Earth, Time, and Life Lab; Natural Disasters	5
		\$1,800	GSC 141L	Principles of Geology Lab	2
Winter 2014		\$900	GSC 350	Natural Disasters	1
		\$900	GSC 491L	Field Module	1
		\$900	GSC 491L	Field Module	1
Spring 2014		\$1,800	GSC 141L	Principles of Geology Lab	2
		\$1,800	GSC 151L	Earth, Time, and Life Lab	2
		\$1,800	GSC 325L	Optical Mineralogy Lab	2
Summer 2014		\$1,800	GSC 225	Quantitative Applications in Geosciences	2
		\$1,800	GSC 225	Quantitative Applications in Geosciences	2
		\$912	GSC 350	Natural Disasters	1
2013-14 Totals		\$25,755			28
Fall 2014		\$1,824	GSC 491L	Field Module	2
		\$1,824	GSC 491L	Field Module	2
		\$1,800	GSC 141L	Principles of Geology Lab	2
Winter 2015		\$1,800	GSC 151L	Earth, Time, and Life Lab	2
		\$1,860	GSC 255L	Field Methods	2
		\$5,472	GSC 255L; GSC 111	Principles of Geology; Field Methods	6
Spring 2015		\$3,721	GSC 350	Natural Disasters	4
		\$3,721	GSC 350	Natural Disasters	4
		\$3,600	GSC 141L; GSC 325L	Principles of Geology Lab; Optical Mineralogy Lab	4
Summer 2015		\$1,800	GSC 151L	Earth, Time, and Life Lab	2
		\$1,860	GSC 225	Quantitative Applications in Geosciences	2
		\$1,860	GSC 225	Quantitative Applications in Geosciences	2
Fall 2015		\$1,800	GSC 151L	Earth, Time, and Life Lab	2
		\$1,800	GSC 491L	Field Module	2
		\$1,800	GSC 491L	Field Module	2
2014-15 Totals		\$36,542			40
Winter 2016		\$1,800	GSC 491L	Field Module	2
		\$1,800	GSC 491L	Field Module	2
		\$2,094	GSC 255L	Field Methods	2
Spring 2016		\$1,898	GSC 255L	Field Methods	2
		\$1,898	GSC 151L	Earth, Time, and Life Lab	2
		\$1,836	GSC 195	Earthquake Country	2
Summer 2016		\$3,673	GSC 195; GSC 350	Earthquake Country; Natural Disasters	4
		\$1,836	GSC 350	Natural Disasters	2
		\$1,836	GSC 141L	Principles of Geology Lab	2
2015-16 Totals		\$35,505			38
2012-16 Totals		\$112,709			122

Graduate Research Assistantships (GAs):

Additional financial awards are made to students in the form of Graduate Research Assistantships (GAs). These are funded from various sources including faculty generated grants and reassigned time (**Table 11**).

Recruitment Efforts:

Recruitment for the Master's program begins with our graduate web page

<https://www.cpp.edu/~sci/geological-sciences/masters-program/index.shtml> that provides detailed information about the program. The graduate coordinator responds to all inquiries and puts prospective applicants in direct contact with faculty members in the appropriate specialty area. A spreadsheet is used to log all information pertinent to the application process. Follow up emails are sent to applicants to acquire copies of all documents so that admissions decisions can be made proactively (commonly the Graduate Admissions office is slow in sending us applications for review).

Applicants to the program are invited to campus to explore the learning environment. This campus visit includes a tour of the facilities, a meeting with graduate coordinator to discuss curriculum and financial aid options, and lunch with available faculty members. We find these face-to-face visits to be a very important recruiting tool.

We also participate in graduate program recruitment fairs. A brochure documenting our Master's program is contributed to the College of Science table, and Geology graduate students are available to answer questions.

I. External funding – contracts, grants, gifts, etc.

Table 11 summarizes the sources of external funding received by Geology graduate faculty since Fall 2012. Our graduate students benefit greatly from these funds that are used to offset tuition costs, pay for laboratory analyses, and support travel to conferences.

Table 11. Geology Department External Support 2012-16						
Academic Year	Faculty Member	Equipment	Student Research Salary / Fellowships / Supplies	Student Travel	Faculty Travel	Faculty Reimbursed Time
2012-13	Marshall		\$11,400	\$7,600	\$10,700	\$20,890
2013-14	Marshall		\$3,300	\$8,100	\$7,300	\$27,365
2014-15	Marshall	\$1,000	\$4,000	\$5,000	\$7,900	\$34,184
2015-16	Marshall		\$2,800	\$4,000	\$2,400	\$32,491
2012-13	Osborn		\$5,000	\$4,000	\$15,201	\$17,111
2013-14	Osborn		\$5,000	\$3,000	\$14,000	\$14,397
2014-15	Osborn		\$6,333	\$3,000	\$14,000	\$15,536
2015-16	Osborn		\$1,500	\$2,627	\$7,000	\$10,755
2012-13	Nourse		\$345	\$2,579		\$12,994
2013-14	Nourse	\$7,500	\$3,190	\$2,786		\$16,783
2014-15	Nourse	\$6,950	\$4,392	\$3,598		\$7,438
2015-16	Nourse	\$9,000	\$2,075	\$2,500		\$2,210
2012-13	Polet	\$40,000	\$30,000	\$6,270	\$7,500	\$62,497
2013-14	Polet	\$60,000	\$25,000	\$12,000	\$6,000	\$60,048
2014-15	Polet	\$47,000	\$53,000	\$13,270	\$7,000	\$63,983
2015-16	Polet	\$60,000	\$38,000	\$12,000	\$6,000	\$68,486
2014-15	Van Buer	\$25,000			\$2,000	\$3,733
2015-16	Van Buer	\$30,000			\$3,500	\$2,987
2015-16	Murray	\$31,000			\$2,000	
4yr Totals		\$317,450	\$195,335	\$92,330	\$112,501	\$473,888

The Geology Department also receives donations each year to support general operations, including equipment service contracts and repairs, undergraduate travel, and undergraduate scholarships. Below is summary of gifts received since Fall 2012:

2012-13

Sally Lane Student Support Fund	\$3,000
Peter Valles Scholarship Fund	\$200
Randal Burns Brunton Compass Award	\$750
General Alumni Contributions	\$1,314

2013-14

Sally Lane Student Support Fund	\$3,000
Peter Valles Scholarship Fund	\$150
General Alumni Contributions	\$1,252

2014-15

Sally Lane Student Support Fund	\$3,100
Peter Valles Scholarship Fund	\$500
Roarke Moudy Mineral Collection (gift in kind)	\$80,000
Randal Burns Brunton Compass Award	\$750
General Alumni Contributions	\$2,360

2015-16

Sally Lane Student Support Fund	\$13,000
Peter Valles Scholarship Fund	\$500
General Alumni Contributions	\$1,430
Industry sponsorships for 2016 Alumni Reunion	\$600

Total Gifts Received 2012-16 **\$111,906**

Section 6 – Suggestions for Action

The Suggestions should include actions that can be accomplished by the department with existing funds and resources as well as actions that may require additional funding or resources.

1. Move the Geology Master’s program back to a state-support funding model.

We request that the MS program be converted back to the state-support funding model that was originally approved by Chancellor Reed in April 2010 (**Appendix A**). As described below, this can be accomplished with existing funds and resources. The program will have greater student accessibility and competitiveness due to lower state tuition. Financial aid options will increase because a) students would be eligible for State University Grants that are not allowed for self-support programs, and b) funds from the graduate-undergraduate tuition differential would be available. The department budget will benefit from the higher FTES, and enrollments in graduate courses will grow through undergraduate participation fueled by the 5-year blended program that we propose in item 2. Meanwhile, our graduate students will continue to be supported through the well-tested mechanisms already in place: external grants, fellowships, Graduate Teaching Assistantships, and Graduate Research Assistantships. The process for converting to state-side involves a simple memo to Christine Mallon at Chancellor’s Office.

Below are the positive impacts of converting back to the state-funded system:

A. Lower tuition will provide greater access to financially challenged students

Beginning 2016-17, the higher tuition required to achieve a break-even budget model in the self-support system will be daunting to most graduate students. The program is expected to charge **\$450/unit** for 500 level courses and **\$650/unit** for 600-level thesis courses, in contrast to the average of **~\$300/unit** that would apply to state-supported courses. **Appendices B and C** show a comparison of state-support vs. self-support tuition for students following 2-year and 3-year road maps, respectively. Below is a summary:

Table 12. Comparison of Tuition For State-Support vs. Self-Support Funding Models		
2-Year Road Map	State-Support Tuition	Hybrid (State + Self-Support) Tuition
Year 1	\$6326	\$8952
Year 2	\$5296	\$10,222
Totals	\$11,622	\$19,174
3-Year Road Map	State-Support Tuition	Hybrid (State + Self-Support) Tuition
Year 1	\$4266	\$6122
Year 2	\$4266	\$11,372
Year 3	\$2844	\$6594
Totals	\$11,376	\$24,088

For the past 3½ years, graduate tuition has been maintained at an artificially low level of \$300/unit through a subsidy shared by the College of Science and College of Extended University. Geology graduate faculty are deeply concerned that the higher fees needed to balance the budget will restrict access to the majority of students. Many of our active graduate

students and current applicants are financially challenged and come from underrepresented groups. It was never our intent to make the Geology MS an elitist program that caters to industry professionals or those with privileged backgrounds.

The only other way to maintain low tuition under the self-support model is to compensate faculty at drastically reduced rates through adjunct contracts that pay overload salary without benefits. We have explored various scenarios in which graduate faculty are paid \$300/WTU for 600-level thesis supervision courses that would be taught in addition to their required state-side teaching workload. While it is possible to devise a balanced budget, the strain on faculty time is not feasible or palatable, particularly when the overload is compensated at a rate of 1/5 to 1/7 of their normal salary.

B. Additional financial aid options will be available to students

Financial aid is a crucial component of recruiting and retaining high quality graduate students. The financial impediments of our current program contradict the University's stated goals of providing access to all qualified students. While the Geology department does everything feasible to provide external support to its graduate students, we find that most are still working half-time or full-time to pay their education and living expenses. Under the state-support system, graduate students will gain access to State University Grants for which they are ineligible in the current self-support program and tuition differential funds.

Another source of financial aid is recovery of the **tuition differential** that is not allowed with a self-support program. Graduate students pay higher state tuitions than undergraduates; e.g. \$1302 vs. \$1058 per quarter for 6 units or less; \$2246 vs. \$1824 per quarter for greater than 6 units enrolled. Part of this differential (approximately \$200 for each graduate FTES) is returned to the College of Science. These funds, an estimated \$7000/year, will be helpful in supporting graduate students with research assistantships.

C. Increased state-side enrollments will offset costs of graduate instruction

We anticipate higher enrollments in our 500-level graduate courses when the fees are reduced to the standard state level. Furthermore, conversion of the 500 and 600 level courses to state-support will increase the Department FTES output by about 16 to 19 per year, equivalent to a gain of about 4%

D. Lower instructional costs with Graduate Teaching Associates (GTAs)

Efficiency in the Geology Department instructional budget is facilitated by the use of Graduate Teaching Associates who teach certain lower division courses at a lower rate than lecturers. The salary differential is about \$300 per WTU. We expect to continue the practice of utilizing GTAs to teach about 40 WTUs per year (see Table 11) equivalent to a savings of about \$12,000/yr.

E. Geology MS program will become more competitive regionally

An unfortunate reality of the current self-support system is loss of high-quality admits due to higher tuition and limited financial aid options. The show rate for non-Cal Poly Pomona admitted students has been low since inception of our MS program. These students regularly cite high tuition and lack of financial aid as reasons for matriculating to other institutions.

For example, we are currently trying to recruit Bryan Castillo, a promising applicant from CSU Northridge. He is eager to join our program, and we have offered him limited support as a Graduate Teaching Associate, but the fees planned for Fall 2016 will be double those charged by his other options. Also Bryan won't be eligible for State University Grants that are badly needed so he does not have to work full time to support his education. It appears that we will lose him to CSU San Bernardino or CSU Long Beach.

2. Initiate a 5-year Blended program to fuel growth and encourage high-quality applicants

Per CSU Chancellor's coded memo AA-2012-01 (**Appendix D**), we propose to start up a blended 5-Year Geology BS / MS program coincident with conversion of our existing Master's program back to state-support. As shown in our 5-year Road Map (**Appendix E**), qualified Geology BS majors would begin taking graduate level courses during Year 4, simultaneously working toward a combined BS-MS degree during their last two years of residence. The Geology MS program would remain open to traditional applicants who have completed a BS degree.

Several Geology graduate students have completed or are nearing completion of what effectively is a blended program. For example, **Rachel Hatch (Table 6)** was admitted in Spring 2014 with **8 units of post baccalaureate credit** earned during her undergraduate tenure at Cal Poly Pomona. She completed her MS thesis and graduated in Summer 2015. Rachel is now a PhD candidate in the Seismology program at the University of Nevada, Reno. Likewise, **Josh Sargent** entered our program in Fall 2012 with **12 units** of CPP post baccalaureate credit. He graduated in Summer 2014. Josh took longer than Rachel to graduate because he was working full-time to cover his expenses during his tenure here. A current example is **Ken Craig**, who entered our program in Fall 2015 with **10 units** of graduate credit. Ken is on track to defend his thesis and graduate in Winter of 2017.

We anticipate several positive impacts of a blended 5-year BS/MS program:

A. Peer mentoring as a recruitment tool

One important factor in growing our enrollments is the peer-mentor relationship resulting from mixed populations of graduate and undergraduate students in our 400-level courses. Since 2012, interaction between these student cohorts on class projects and field trips has been mutually beneficial, as has engagement of undergraduates as research assistants on MS thesis projects. In addition, Graduate Teaching Associates who teach several of our lower division courses serve as important advocates of the program. These types of interactions encourage graduating seniors to continue on with the Geology MS program at Cal Poly Pomona, fueling a self-sustaining recruiting system. That is the crux of our blended program plan.

B. Shorter time to degree

Blended programs were conceived as an efficient mechanism for students to obtain a Bachelor's and Master's degree in short time. It is possible for a motivated student to complete both degrees in 5 years (see **proposed 5-Year Road Map, Appendix E**). In contrast "traditional" graduate students entering under the existing system spend 4+ years to complete a BS degree, then an average of 2 ½ years finishing the MS degree.

C. Enhanced enrollments in 500 level graduate courses

Because selected undergraduate students will be allowed to enroll in 500-level graduate courses, we expect an immediate boost in enrollment. However, this impact will only gain traction if the fees are concurrently reduced to the standard state level.

D. Increased program efficiency

Given that students admitted to the blended program will already be in residence and well-known to the faculty, several time-consuming processes will be circumvented. Application / admission / initial enrollment logistics will be streamlined. Blended candidates will not experience the difficulty in securing living arrangements faced by traditional grad students relocating from out-of-town or out-of-state. Orientation and advising will be simplified because candidates already know the Cal Poly Pomona system. Selection of a thesis topic will be easier as the candidates know the graduate faculty and will have discussed potential projects before applying. Some candidates might use their Senior thesis project as a pilot for an MS thesis (this is the case for several of our students).

E. Chancellor's Office support for new blended programs

Blended programs are categorized as "Promising Practices" by the Chancellor's Office. This would be the first program of its kind in the College of Science at Cal Poly Pomona. What the Geology Department learns from its experience could potentially be scaled to larger programs such as Biology, Mathematics, and Chemistry. We expect to benefit from Chancellor's Office support.

3. Hire two new tenure-track faculty in areas of "Earth System Science/Global Environmental Change" and "Remote Sensing / Natural Hazards Assessment / GIS"

A limiting factor in growing and sustaining our graduate program is the number of tenure-track faculty. We have managed to maintain an active graduate student body of 27 -32, but available faculty resources and time are severely taxed. In accordance with the Geology Department Strategic Plan, we request two tenure-track faculty hires during the next two years. The proposed areas of expertise are aligned with the current mission of Cal Poly Pomona, and integrate with the recently proposed "cluster hire" areas:

Assistant Professor of Earth System Science / Global Environmental Change

A new faculty hire in this area of specialization is aligned with the University's strategic interests in sustainability and water management, and would strengthen our BS program in two popular emphasis areas: Geophysics/Earth Exploration and Environmental Resources. Directly relevant classes include Blue Planet, Meteorology, and Exploring Earth's Oceans. A new faculty member is needed to develop graduate courses in Global Climate Change, Atmospheric Science, and Urban Sustainability, and to supervise our growing cohort of environmentally inclined MS students. Significant grant opportunities exist in the area of Climate Change. Although other CSU universities have hired faculty with similar expertise in recent years, no such hires have been made at Fullerton or San Bernardino so the enhanced curriculum would attract new local students to our program.

Assistant Professor of Remote Sensing / GIS / Natural Hazards Assessment

A new faculty hire in this area of specialization is aligned with the University's strategic goals of developing industry partnerships, utilizing digital technology, and improving urban environment. The new person would strengthen our BS program in popular emphasis areas of Geophysics/Earth Exploration and Environmental Resources. Directly relevant classes include GIS Applications, Natural Disasters, Engineering Geology, and Living in Earthquake Country. Graduate courses would be developed in Remote Sensing, Geomatics, and Neotectonics. We also expect enhanced collaboration with the geotechnical industry and scientists from the Jet Propulsion Laboratory. GIS is a highly marketable skill in local industry. Although other CSU universities have hired faculty with similar expertise in recent years, no such hires have been made at Fullerton or San Bernardino so there are opportunities to attract new local students to our program.