AY20 Expedited Program Review Template
Updated 2-5-2020

Submission date: 6 February, 2020

Program/s in this review: Geological Sciences BS

Specialized accrediting agency (if applicable): NA

Campuses where the program is delivered: Anchorage

Members of the program review committee:

- Simon Kattenhorn, Professor and Director, Anchorage
- LeeAnn Munk, Professor, Anchorage

1. **Centrality of Program Mission and Supporting Role (700 words or less – 636 words)**

Geological Sciences offers courses that support numerous programs across the UAA system. These include 3 lecture courses and 3 lab courses in the Tier 1 GER program, and 1 online integrative capstone course in the Tier 3 GER program. Courses in geological sciences are referenced as assisting to meet degree requirements in the following degree programs:

- CIVL-BS: Bachelor of Science in Civil Engineering
- GEOM-AAS: Associate of Applied Science in Geomatics
- CMGT-BS: Bachelor of Science in Construction Management
- ENSO-BS: Bachelor of Science in Environment and Society
- ENSO-BA: Bachelor of Arts in Environment and Society
- NSCI-BS: Bachelor of Science in Natural Sciences
- GISY-MINOR: Minor in Geographic Information Systems (GIS)

Additionally, the program has an agreement with the BS Geological Engineering program at UAF that permits their majors to complete some of the degree requirements at UAA as a 2+2 program that utilizes courses offered in our department and the College of Engineering at UAA.

The UAA Geological Sciences program is highly regarded in the state of Alaska, providing quality graduates who have historically been highly successful at obtaining **high-impact jobs** in geosciences in the state. Our graduates have also been accepted into graduate programs (MS and PhD) around the country, including the #1 ranked geosciences program (Univ. of Texas at Austin). Recruiters from geoscience employers frequently reach out to the department to recruit our graduates into positions in the mineral resources/mining industry, environmental geology, and numerous positions within the Department of Natural Resources, particularly the Alaska Division of Geological & Geophysical Surveys. The attractiveness of our graduates is emphasized by the annual UAA Geosciences Career Fair which is coordinated by the Student Geology Club and attracts 20-30 companies each year from around the state who wish to recruit our graduates.

The department engages in partnerships with outside agencies, businesses, and organizations through their participation in our Community Advisory Board (CAB), whose 18 members represent industry interests in oil/gas and mineral resources, environmental geoscience consultancies, geotechnical and engineering fields, federal agencies, and Alaska Native corporations. The department has many strong ties with the resource related industries in Alaska. These relationships have culminated in many positive outcomes for the department and UAA. For example, the success of the department has been greatly enhanced by external investment in the program which has provided the department with the following resources:

- A $200,000 donation in 2009 from the Alaska mining industry to support a mineral resources program at UAA and which led to the creation of a tenure-track faculty line.
2. Program Demand (including service to other programs), Efficiency, and Productivity (7 year trend; 1400 words or less – 1079 words)

Seven year degree and/or certificate awards trend: The BS program in geological sciences has produced a consistent number of graduates per year over the past 7 years, averaging 14 students per year. These numbers indicate a stable degree program that consistently produces more graduates than the equivalent BS program at UAF, whose numbers are also robust and demonstrate the viability of undergraduate geology programs at both institutions.

Credits Per Degree (Average Credits Earned): These data indicate that BS geological sciences majors have been guided to complete their degrees in a timely and focused manner, with the average number of credits per degree only slightly exceeding the required 120 credits. The department instituted individualized faculty advising in 2017 with a commitment to student success and guiding students along the most efficient pathways to degree completion.

Seven year majors or program enrollment trend: Geological Sciences has demonstrated robust enrollments over the past 7 years. The variation and recent decline closely track the vicissitudes of student enrollments across the university system (see UAF geosciences enrollment data trends for comparison). There is a higher number of undergraduate majors in the BS geological sciences program at UAA as compared to the UAF geosciences program; nonetheless, both departments show strong enrollment trends that speak to the importance of geology programs on both campuses.

Course pass rates: Course pass rates in geological sciences courses are high, consistently exceeding 90% over the past 3 years, reflecting the department’s commitment to student success at all levels of the curriculum. Passing rates in 100-299 level courses exceed CAS averages by 6-8% over the past 3 years. The department also works hard to ensure that course completion rates remain high, even in high-enrollment courses. Completion rates are consistently >85% despite a student to instructional staff ratio of 92:1, with a median completion rate of 100%.

Internal demand: Geological Sciences courses show strong internal demand both inside and outside of the major. The department offers 5 courses within the Tier 2 GER system that are primarily completed by students outside of the major. These include GEOL A111 Physical Geology, GEOL A111L Physical Geology Laboratory, GEOL A115 Environmental Geology, GEOL A115L Environmental Geology Laboratory, and GEOL A221 Historical Geology. The department also offers 2 courses in the Tier 3 Integrative Capstone GERs: GEOL A361 Earth Resources & Society (online course) and GEOL A468 Geomicrobiology (Biological Sciences faculty instructor). The internal demand for GER courses in geological
sciences has increased significantly over the past 2 decades, as reflected in large increases in the enrollment trends for GEOL A111 Physical Geology during both the regular academic year and the summer semesters.

Seven year Student Credit Hour (SCH) production trend: The BS Geological Sciences program has demonstrated robust enrollments over the past 7 years despite reductions in FTE instructional staffing and decreased enrollments across the university system. This program strength continues a trend over the past 15 years of generally increasing SCH production (e.g., see 15-year Fall enrollment trends). A comparison of 5-year enrollment trends in geosciences at UAA and UAF during the Fall, Spring, and Summer semesters reveals that UAA consistently exceeds UAF enrollments despite a smaller number of tenure-track faculty lines (currently 5 at UAA vs. 17 at UAF), speaking to the successful efforts of UAA Geological Sciences to maximize instructional efficiency with limited resources. Nonetheless, strong numbers in SCH production trends in both departments reflect the importance of geoscience degrees across Alaska to provide sufficient graduates in this high-impact job area. UAA Geological Sciences has been particularly successful at maximizing potential in summer semester enrollments, with a 108% increase in summer enrollments between 2014 and 2016, with high enrollments being maintained through 2018. A reduction in summer enrollments in 2019 reflects a smaller number of course offerings rather than reduced fill rates, due to an instructional staffing shortage.

SCH/FTEF: The BS Geological Sciences program has demonstrated a trend of increased instructional productivity and efficiency over the past 7 years, reflecting the efforts of the instructional faculty to offer courses that both support programmatic needs as well as providing internal demand for non-majors. This productivity at the current staffing places geology in the upper tier of CAS programs for instructional efficiency.

Enrollment/Full Time Equivalent Faculty (FTEF): The BS Geological Sciences program has demonstrated increasing enrollments relative to FTEF over the past 7 years, reflecting the department’s commitment to instructional efficiency of the program.

FTES/FTEF: The ratio of Full Time Equivalent Students to Full Time Equivalent Faculty has been steadily increasing in the BS Geological Sciences degree program over the past 7 years, reflecting increasing instructional efficiency. FTES/FTEF in Geological Sciences now exceeds the CAS average at the 100-499 course levels.

Class Size (Average Class Size): Average class size at the 100-499 level in Geological Sciences has been steadily increasing over the past 7 years.

Cost/SCH: The cost per student credit hour in Geological Sciences now approaches the average amount for the College of Arts and Sciences (excluding the School of Education).

Tuition Revenue/SCH: A steady increase in tuition revenue reflects the department’s strong enrollment trends combined with tuition cost increases per SCH.

External demand: see 2020 program review data.

Tuition revenue from undergraduate level courses in geological sciences is effective in covering the associated faculty costs of offering these courses. For example, IR data from the Spring 2019 semester shows that total tuition revenue resulted in a net gain of $134,956 to UAA after accounting for faculty costs. The relatively high costs associated with offering upper division courses within the major are more than offset by the tuition revenue from lower division courses. Fees are not used to cover the cost of faculty as this is not the purpose of mandatory course/lab fees as per university policy.

Extramural funding is a significant contribution to supporting faculty salaries for non-instructional activities (i.e., sponsored research) and is also used for the purpose of course buyouts. The department faculty have been particularly successful in obtaining extramural funding to support student success (e.g., by providing research assistantships for graduate students), increase tuition revenue (graduate student tuition may be paid by grant funds), and for subsidizing faculty salaries. The department has received ~$6.4 million in research funding support over the past few years.
3. **Program Quality, Improvement and Student Success (1500 words or less – 1301 words)**

   The BS Geological Sciences Program had 72 majors in FY2019, representing a small decrease over the past few years commensurate with decreasing enrollments overall at UAA, but an otherwise healthy population of majors over the past 9 years. A portion of this decrease may be in response to a department-implemented increase in the rigor of degree requirements to ensure our graduates will be competitive for 21st century geoscience careers. Currently, 40% of enrolled BS GEOL majors are Seniors, implying that the number of awarded degrees will remain strong in the coming years. In contrast to actual enrollments, as of September 2019, the BS GEOL major had 154 admitted students, reflecting that a large number of BS GEOL students do not enroll full-time or are part of a transitory student population who progress through the degree intermittently, consistent with the findings of Vice Provost for Student Success Claudia Lampman’s analysis of UAA students in general (i.e., typical degree completion duration of 6-10 years).

   The BS Geological Sciences curriculum is updated regularly, including a rigorous curriculum reform in 2018 (as per the AY18-19 catalog requirements for the BS GEOL degree) in order to address past assessment results. Past assessments identified distinct weaknesses in certain background preparation related to programmatic student learning outcomes (SLOs) that were creating impediments to student success in more advanced (300- and 400-level courses). The current innovative curriculum was designed around a foundational construct of progressively developed knowledge, skills, and abilities (KSAs) that would enhance student success at attaining all student learning outcomes as they navigate their way through the new curriculum in a logical progression. Moreover, the redesigned curriculum was implemented in concert with increased investment in faculty advising, so that majors could be guided through the degree requirements without missteps and detrimental course sequence decisions.

   The new curriculum is also based upon revised course pre-requisite definitions such that students must progress through the degree program in a logical fashion, with course offerings being scheduled in such a manner to avoid gaps in student progression through the degree. A number of these courses are new, created specifically to enhance student success in the degree program by focusing on critical KSAs at key points during the degree progression. The department also provides 2 introductory Tier 1 GER courses and 1 integrative capstone Tier 3 GER course through online offerings, providing critical distance learning opportunities for Alaskan students. The department is also invested in Quality Matters evaluation of our courses and provided one of the first courses at UAA to be considered for QM review (currently in progress).

   UAA BSGS students work on real-world surface and subsurface data using industry-standard software and programs in their classes and research, which prepares them well for their profession. As per the 2019 AGI report, students and employers across the country expressed concerns about the lack of opportunities in the development of professional skills, as well as higher-level quantitative skills. The UAA BSGS program has specifically designed courses in professional development and data analysis in the curriculum, which prepares students for their career. These applied courses were specifically integrated into the UAA program based on the guidance from Alaska industry professionals who were very vocal about Alaska’s needs for employees trained in applied geological sciences; in turn these courses provide Anchorage-bound students with skills to get high-paying jobs upon graduation in a field that is in demand, and is projected to grow.

   UAA Geological Sciences program is not required by UAA or the College of Arts and Sciences to conduct their own academic advising, relying instead on professional academic advisors. Despite this model, the geological sciences faculty offer ~1-hr advising sessions to each BS student major each semester to ensure student success. Every student is designated a faculty advisor upon entry into the major, regardless of academic level, and faculty reach out to students individually to schedule advising appointments. This internal department advising is offered to students in addition to college-level advisors and is included in faculty workload contracts. Additionally, a number of more intimate departmental gatherings are organized each year to encourage BS students to get to know faculty, graduate students, and staff.

   UAA Geological Sciences faculty are fully supportive of high-impact teaching practices with emphasis on research experiences, field courses, field activities, internships, capstone courses, and public outreach events. In particular,
 undergraduate research is a highly valued activity. Every tenure-track faculty member has advised multiple BS research projects with a total of 36 distinct enrollments in 498 (Student Research) or 499 (Senior Thesis) courses since FY2013. A geology field course and many other field-based activities are required in the BSGS program. For example, 7 of the required courses in the BS Geological Sciences curriculum include required field-based experiences, and 2 of the upper division elective courses also include capstone field experiences. The annual UAA Core Workshop also provides students with an opportunity to research rock cores and share their work with Anchorage professionals and public at the Geologic Materials Center. Importantly, our courses now place more emphasis on professional development and quantitative analysis.

Geological Sciences majors have demonstrated successes in obtaining summer internships and post-graduation full-time employment as well as acceptance into prominent graduate programs. Numerous students have completed internships with the Alaska Department of Natural Resources, Geologic Materials Center, Pogo Mine, BLM, and other high-impact industries. With the recent addition of more research-active, tenure-track faculty, at least 17 students have continued into graduate programs, including some of the most competitive programs in the country. Examples of our student successes include:

- At least 3 recent graduates have continued into PhD programs, including 2 at the top-ranked geoscience program in the country (Univ. of Texas at Austin).
- One of these recent graduates (now a PhD student) was awarded a prestigious and highly competitive graduate fellowship from the National Science Foundation.
- At least 14 recent graduates continued into MS programs.
- Of these, 11 recent graduates proceeded to enroll in the department’s MS program in Applied Geological Sciences.
- Geological Sciences graduates historically have demonstrated a >90% success rate in obtaining full-time employment in their discipline, including recent placements at the Alaska Division of Oil & Gas (Dept. of Natural Resources), Pogo Mine, and local industries in Anchorage.
- Numerous students engaged in high-impact research activities have received research grants from either the UAA Honors College or the Alaska Geological Society.
- One BS Geological Sciences major was awarded the prestigious Dwornik Award by the Geological Society of America for the Best Undergraduate Poster presentation at the 2019 Lunar and Planetary Science Conference in Houston. This same student was selected as having a Noteworthy Poster Presentation at the 2019 Geological Society of America annual meeting in Phoenix.
- At least 3 geology majors were past recipients of the Geological Society of America’s “On to the Future” awards.


The UAA Geological Sciences department also offers a Master of Science degree in Applied Geological Sciences. This degree was developed to meet the demand of local industry professionals who could not advance in their current jobs or apply for higher-paying jobs in geology without the MS degree. Moreover, the entry-level degree for the oil/gas industry is an MS, thereby offering our place-bound student body higher-paying job opportunities by continuing their education. In summary, the UAA Geological Sciences program is unique in terms of the student body it serves, the applied curriculum it offers, its successful track-record of getting students jobs, and the faculty that compose it.

4. **Program Duplication / Distinctiveness (300 words or less – 299 words)**

Geological Sciences programs are currently offered at UAA and UAF, with stand-alone geoscience courses also offered through UAS and several community campuses. Undergraduate enrollments at UAA have consistently exceeded
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those at UAF over the past decade. In FY2019, the **BS Geological Sciences program at UAA had 44% more majors than the BS Geosciences program at UAF** and was responsible for **31% more student credit hours** of enrollments in geology courses than UAF (3238 SCH at UAA versus 2478 SCH at UAF). Nonetheless, enrollment trends are strong at both MAUs, reflecting the ongoing strength and future potential of geoscience programs in Alaska in support of high-impact job areas.

Nationwide, the average number of geoscience degree programs per state is ~12. Only 6 states, including AK, have 4 or fewer geoscience programs. Resource-rich states have the highest number of geoscience programs, illustrating that multiple departments in energy- and mining-rich states are warranted to serve the industries in those states, and that as a resource-rich state AK has very few geoscience departments compared to our peers.

The Geological Sciences program at UAA is distinctive because of the unique industry needs and the student body served in Anchorage. This role should not be considered a duplication or overlap due to the uniqueness of the program. The program at UAA was developed to serve the more non-traditional, place-bound student body that typifies UAA and the Anchorage area. Without this program, the largest city in Alaska would not have access to critical job skills (**i.e., oil/gas, mining, environmental**) that help sustain and build Alaska’s resource-based economy. Furthermore, the UAA BSGS is unique in its course offerings, comprising a small selection of fundamental/theoretical courses supported by a far greater number of applied courses in job-specific disciplines such as environmental sciences, hydrogeology, applied geophysics, and petroleum geosciences.

5. **Summary Analysis (500 words or less – 338 words)**

The UAA Geological Sciences department provides critical opportunities for place-bound Alaskans in the Anchorage area and surrounds to obtain a BS degree in a **high-demand, high-impact job area** in the state of Alaska. The curriculum is innovative with an emphasis on transformative learning experiences and the development of applied work skills, built around a core progression of knowledge, skills, and abilities to enhance student success. The number of majors and course enrollments have shown robust positive trends over the past 7 years and demonstrate UAA to be a key player in providing graduates needed to support one of the most critical workforces in a resource-dependent state.

The department has benefited from strong community engagement and external financial support, with **over a quarter million dollars in industry contributions over the past 5 years** and **over $150 million equivalent dollar value in software donations** from numerous software developers.

The department’s students have been successful at gaining full-time employment upon graduation, and have benefited from numerous scholarship awards, national honors and prizes, and internship experiences that speak to the quality of geoscience education offered at UAA. The department consists of only 5 tenure-track or tenured faculty, who have worked hard to maximize their instructional efficiency while collectively bringing in **$6.4 million in research funds over the past 5 years** in support of departmental research projects. The faculty are internationally recognized for their research accomplishments, having published in some of the best high-impact journals in the world. UAA Geological Sciences is also the only geoscience department in the world to have two active members of the editorial board for the world’s top-ranked geoscience journal, *Geology*. Students benefit immensely from learning geoscience from these prestigious researchers with past graduates consistently reporting back to the department regarding the high level of preparation they received for their geoscience careers or graduate programs. The future potential of the program is high but will clearly benefit from ongoing future investment in building capacity through more tenure-track faculty lines that will permit more course offerings and higher enrollments.