As we have concluded our work on the 7th Cycle Program Review, awaiting the concluding MOU, our view is to the future, and what to do with the information we’ve garnered from this review. One of the major goals identified in the program review is to develop an MS in Environmental Science, based on the success of our BS in Environmental Science and the rapid recent development of this career path. The reviewers noted, that the Department already has the faculty expertise, facilities and curriculum to service a MSES program. They also noted that top students from the recent BSES program could be readily recruited into the MSES, and BSES students would benefit from the course and research interactions with MSES students. Finally, they noted that an MSES would complement the other master’s programs and fill an important regional need for Bay Area and California organizations involved with environmental compliance and monitoring. This report thus combines assessment of our current situation, building on the program review, and uses this and other regional information to help define the path forward.

The map to the left indicates M.S. programs in Central and Northern California similar or related to that proposed here as well as related undergraduate programs. This includes other CSUs as well as UC and private universities. Each of these has at least one related program at the undergraduate level. Of the 20 universities, only three have directly similar M.S. programs to that proposed here. Of CSUs, Monterey Bay (M.S. Environmental Science) and Cal Poly San Luis Obispo (M.S. Environmental Science and Management) are the most similar, and of other universities only UC Merced has a similar program (M.S. Environmental Systems), although this program seems less focused on professional training. Another six of the 20 universities surveyed have ‘related’ programs, which generally have some overlap though largely different focus. For example, CSU Chico’s program, M.S. Geosciences and Environmental Sciences focuses on environmental geology and Stanford’s M.S. Earth System Science is focused on academic geoscience, while other programs focus much more on environmental policy, land use planning or resource management such as UC Davis (M.S. Environmental Policy and Management), San Jose State (M.S. Environmental Studies), University of San Francisco (M.S. Environmental Management) and Humbolt State (M.S. Natural Resources: Environmental Science and
Management). Two local UCs, Berkeley and Santa Cruz have undergraduate programs and PhD programs in Environmental Science, but not an equivalent Master’s Program.

Environmental Science is a growing field in professional employment. The US Bureau of Labor Statistics lists 89,500 jobs currently (2016) and predicts an additional 9,900 by 2026, an 11% increase. This demand can be seen in our own BS Environmental Science program, which started in Fall 2016, has increased to 134 majors in Spring 2019 (a 10% from Spring 2018), though students entering the proposed MS ES are likely to also come from related programs in the natural sciences. In contrast to the scarce MSES programs, the map above indicates 20 universities in Central and Northern California that have one or more undergraduate programs that would directly feed into a new M.S. Environmental Science (e.g. B.S. Environmental Science, Environmental Studies and Geography). In addition, we aim to target students with undergraduate degrees from related programs in the natural sciences such as Biology, Chemistry, Earth Science and Geography who are interested in applying their undergraduate education towards a professionally-focused Master’s degree in Environmental Science. Most of these programs are within the Bay Area, (13 lie in a triangle between Santa Cruz, Santa Rosa and Sacramento) including our own rapidly growing BSES in the Department of Geography & Environment at SFSU. Based on the success of our BSES program, it is reasonable to expect that we would attract new potential Masters’ students from the region as well as Southern California, particularly students whose frame of reference in their academic paths to date has been Environmental Science. An exit survey of seniors in our BS Environmental Science in Spring 2018 showed that, of students who wanted to continue to graduate studies, 50% said they would be interested in applying to a proposed new program in MSES at SFSU.

We expect to graduate 40 BS ES students a year by the time the MS ES initiates, which would yield 20 applicants a year if our survey is accurate, though this would be a high estimate though coupled with other sources is not unreasonable. Given other feeder programs, including multiple programs at SFSU as well as other universities in California and elsewhere, we would expect to get at least 20 applicants and more likely more, from which we can admit suitable candidates at the rate of approximately 10-15 a year, based on available faculty. Current grad programs have graduated 12/year in relation to 45/year BA Geography. Since there are ~50% more ES majors than Geography majors, we could use that ratio to predict graduating at the high end a rate of 18/year after 5 year. The net addition to all of our programs will however be considerably less, perhaps 12, given that some students will choose this program over other of our programs.

A survey of 56 environmental professionals, mostly in California, was conducted to identify the kinds of work they do, and the skillsets highly valued by their employers (survey report available). About half of respondents worked for government agencies (at all levels, with State and Federal the highest), while the remaining respondents worked for non-profit or for-profit environmental organizations as well as working as independent contractors consulting for many of the above. The survey showed high demand for the unique set of skills that an environmental science degree can provide. These include, field based measurement and monitoring techniques, closely followed by geographical information science techniques and
knowledge of key environmental acts and policy implementation. Specialized knowledge and skills that were highly desirable included, water quality, air quality, ecosystem science, wetlands, water resources, soils, other national acts, environmental justice, and climate change. In addition, the State of California recently designated Environmental Scientist as a career category, so we anticipate the professional demand to continue to grow. We aim to develop the MSES program specifically to meet this professional demand, focusing on the general skillsets that were clearly articulated across the survey, as well as knowledge specialization within the broader field.

Among STEM fields in the USA, environmental science and geoscience have one of the least diverse student bodies, and this flows through to the professionals who are responsible for monitoring and managing our biophysical environment. At SFSU we have the opportunity to recruit and advance a diverse community of environmental science students and to provide a conduit for them to rewarding professional careers. Of the potential student demand for a new MSES in the Bay Area, evidence from our existing BS Environmental Science and interaction with high school AP Environmental Science classes shows there is a diverse pool of potential students in the region and across California, thus providing us with an opportunity to contribute significantly towards increasing diversity in the field and profession, particularly through development of a degree designed from the ground up to be accessible, flexible and inclusive, and to include focused recruitment plans.

The Department of Geography & Environment has existing graduate courses that specifically target the skillsets identified by a survey of environmental professionals (field methods and monitoring, GIScience and environmental management and policy). These courses are offered regularly, and have plenty of capacity owing to the relatively low graduate student numbers in recent years, commensurate with declines felt across campus. It is also possible that core courses could be offered in other departments or through more innovative cross-departmental team teaching potential such as utilizing existing cross-listed courses and through 0% appointments. A new introductory seminar in the scope and methods of environmental science would be proposed. The resources for one additional 3-unit seminar course can be found from existing WTUs in the Dept. of Geography & Environment, but the intent, design and implementation would cross departmental and traditional disciplinary boundaries as much as possible. This course would be important for providing an effective first semester platform, initiating cross-disciplinary and department ties early, as well as developing a supportive cohort and community experience for the students. These experiences will be important for student success rates, especially for non-traditional students.

Structure of MSES Degree Program: Given the interdisciplinary nature of environmental science, our vision is to develop a program structure that connects faculty from the Departments of Geography & Environment, Earth & Climate Sciences, Biology, and Chemistry & Biochemistry, but maintains an easy-to-navigate program flow with a strong sense of cohort development. We propose to run the program from the Department of Geography & Environment, where we have the existing resources for core classes in field methods, GIScience, and environmental policy, as well as program advising, and lab, software and equipment
facilities, including the Institute for GIScience. Some core courses could also be replaced by courses in associated departments as appropriate to the student’s focus. A new fully interdisciplinary core introductory seminar will be proposed on the scope and methods of environmental science, designed to introduce incoming students to the broader discipline, the MSES program, and the associated faculty and environmental science research being conducted at SFSU, as well as formulate a strong cohort for internal program support. It could be resourced by the Dept. of Geography & Environment (or shared) but would be structured around a joint environmental science speaker series, thesis presentations, and organized interaction between students and different research labs across campus to ensure that interdisciplinary opportunities can be developed from the outset. In addition, students would take elective classes or independent studies from a selection of classes from the associated departments, and this could also include 898 Masters Thesis from the department of the principle thesis adviser. All faculty associated with the degree could conduct thesis advising and serve on thesis committees, and will be invited to be involved in admissions decisions and program development. In general we would strive to find innovative ways to facilitate co-benefitting, cross-department teaching collaborations through mechanisms such as 0% appointments, increased thesis committee collaborations, and participation in a core program seminar and College-wide environmental science speaker series. This inter-departmental collaboration will be highly valuable for students in the program because of the large number of specialty areas in environmental science and the significant academic interest in environmental science questions of faculty across the College. Moreover, there are already research collaborations and complementary research interests among faculty in CoSE and this program could help support the development of these connections.

A summary of our proposal was sent out to faculty and chairs in CoSE whose research was related to environmental science in early summer 2018. We received responses from 12 interested faculty in the Departments of Biology, Chemistry & Biochemistry, and Earth & Climate Sciences. The MSES Committee organized a follow-up meeting in early October 2018 to discuss the goals and characteristics of the degree particularly ways to minimize overlap with other programs and better fill an academic and professional niche. The outcome of this meeting and feedback in general was the revised degree prospectus presented here. We aim to continue to develop these collaborations throughout the building and implementation phases of the MSES.